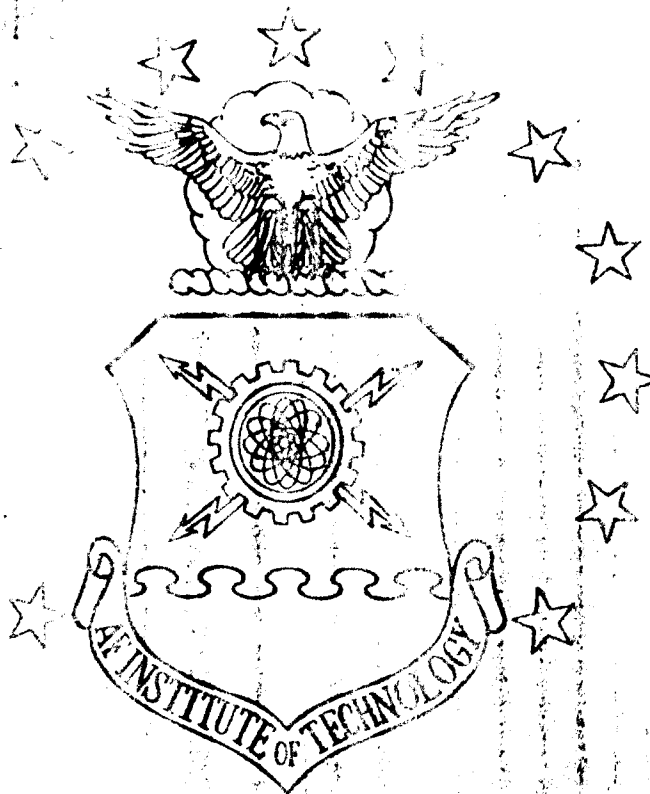


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ANALYSIS OF THE EFFECT OF CURRICULUM
STRUCTURE ON STUDENT PERFORMANCE
MEASURES IN A COMPUTER-BASED
INSTRUCTIONAL ENVIRONMENT

THESIS

James F. Altensee, Captain, USAF

AFIT/CCM/UCR/000-1

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ANALYSIS OF THE EFFECT OF CURRICULUM STRUCTURE
ON STUDENT PERFORMANCE MEASURES IN A
COMPUTER-BASED INSTRUCTIONAL ENVIRONMENT

THESIS

Presented to the Faculty of the School of Logistics
of the Air Force Institute of Technology
Air University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Systems Management

James F. Altensee, B.S.

Captain, USAF

September 1990

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Jim Altensee

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Abstract

Recent experiments emphasize the need for further research to determine how to design and use computer-based instruction (CBI) with maximum effectiveness. This research addresses that need by investigating the differences caused by top-down or deductive and bottom-up or inductive curriculum (lesson) structuring in self-paced CBI. Three research variables were measured to investigate these differences: student learning (measured by performance testing), CBI course completion time, and student attitude toward the learning experience. Computer programs, written for each curriculum structure using BASIC programming language, were administered to students at the Air Force Institute of Technology in post-test randomized design experiments. Descriptive statistics and nonparametric tests were used to analyze these results. The nonparametric tests showed that the data was not statistically significant (at 0.1) for any of the three variables. This key finding indicated that CBI educators can use either curriculum structure with almost equal effect. In addition, the differences which resulted were used to develop scenarios where one variable was seen as the primary objective with the other two of lesser (but still essential) importance. Such an analysis offers guidance to CBI educators seeking

the structure which maximizes their particular learning objective.

ANALYSIS OF THE EFFECT OF CURRICULUM STRUCTURE
ON STUDENT PERFORMANCE MEASURES IN A
COMPUTER-BASED INSTRUCTIONAL ENVIRONMENT

I. Introduction to the Study

Background

Recent studies have shown that computer-based instruction (CBI) has potential to help the Department of Defense deliver cost-effective education and training (4:18-19; 6:33-34; 16). One 1989 study conducted at the Air Force Institute of Technology found that CBI produced a 7% improvement in learning and a 67% reduction in time when compared to the results of teaching the same material by traditional classroom methods (21:57-58). These and similar experimental findings underscore the importance of further research to determine how to design and use CBI with maximum effectiveness.

Specific Issue

Whether instruction is delivered in a traditional classroom or by CBI, several elements interact to influence the learning process. As labeled by Gowin (12:24-25), these elements are:

governance--the social context by which the
educating process occurs.

curriculum content--the content of a lesson.

curriculum structure--the structure of a lesson.

teacher--the instrument that delivers the
instruction.

student--the person receiving the instruction.

When these elements are viewed in terms of Air Force education and training, some of them act as constants while others are variables in the learning situation. For example, Air Force regulations specify the types of knowledge that individuals must possess in order to perform specific jobs. Said another way, the content of each Air Force curriculum is a constant specified by Air Force needs. In addition, the fact that the Air Force provides education or training to supply the knowledge required by its members and civilian employees according to Air Force guidelines means that the governance or "social context" of the instruction is also a constant.

When CBI is used, the teacher is another constant. Unlike traditional classrooms, where a teacher's personality and style of teaching can assist or impede learning, CBI instruction exposes each student to the course content through the medium of words or graphic images displayed on a television monitor (in some cases enhanced by computer generated sound.) Thus, the delivery from classroom to classroom is unaffected by teacher style or personality.

When governance, teacher, and curriculum content are held constant, the other two elements--the curriculum structure and the student--emerge as key variables in potential CBI instruction within the Air Force. The research project described in this report examined the interactions of these two variables. Specifically, it studied the learning effects produced by two different content structures on two randomly assigned groups of students.

Research Question

The primary question addressed in this research can be stated as follows:

If the same body of content is arranged in a top-down (deductive) structure and a bottom-up (inductive) structure and presented to students by computer-based instruction, what (if any) differences occur in student learning (measured by performance testing), in course completion time, and in student attitude toward the learning experience?

Definition of Key Terms

The following definitions further explain the research project:

Top-down (Deductive) Structure: structure which presents material such that a general concept or idea is presented and subsequently broken down into lower level constructs which can detail, explain, identify, or demonstrate the original concept.

Bottom-up (Inductive) Structure: structure which is essentially the inverse of top-down, where lower level details or constructs are presented first and then summed (or lead) to a generalization.

Performance Testing: the use of objective (multiple-choice) test questions to measure student learning from the CBI experience.

Course Completion Time: that amount of time measured from the point when the student starts the CBI to the completion of the CBI.

Learner Attitude: an indication of whether students like or do not like the content structure of the CBI presentation.

II. Review of Literature

This chapter describes the theoretical literature that contributed to the research described in this report. Additional literature that supports the study's methodology is discussed in Chapter III.

Top-down and Bottom-up Structuring

As defined in Chapter I, top-down structure requires deductive reasoning processes, whereas bottom-up structure requires inductive reasoning. The more formal terms "deduction" and "induction" describe the learning process in the student's mind, while the less formal synonyms "top-down" and "bottom-up" describe the way a curriculum planner views the structure. The more formal terms are customary in the literature reviewed here.

In the Handbook of Research on Training, Henderson speaks primarily of inductive and deductive processes in structuring material for an educational application. Top-down structure, using his terminology, is referred to as "tell-and-do" structure, and "bottom-up" structure is referred to as a "heuristic" method. According to Henderson, applying the top-down or deductive structure requires the following steps:

1. Explicitly telling the student the item or concept to be learned (10:1014).

2. "Clarifying, if necessary, the meaning of the description used to express the knowledge" (10:1014).
3. Justifying or asserting the importance of the item to help student motivation in mastering the concept (10:1014).
4. "Clinching the understanding of the item (this is often done by having the student work problems based on the knowledge being taught" (10:1014).
5. "Making the transition to the next item being taught" (10:1014).

The bottom-up structure uses a different structure of content for presenting a concept. Henderson describes the steps in the following manner:

1. Presenting instances [or examples] of the item or concept to be taught in order to enable the student to form hypotheses (10:1014).
2. "Presenting evidence, perhaps even more instances, serving either to confirm or disconfirm the various hypotheses students state or appear to acting on" (10:1014).
3. "Stating or having a student state the item of knowledge [the concept, rule, or generalization] which is a warranted inference from Steps 1 and 2" (10:1014).

In a collection of research efforts concerned with how people organize their knowledge in the process of understanding and retaining new knowledge, Abelson and Black

identify top-down processing as one of the three main propositions on which schema theories are based (11:4). A schema, in their terms, is a knowledge structure, and their central hypothesis is that knowledge is organized in chunks or packages in an individual's mind. They define deductive or top-down structures as those in which the meaning lies above the text or explanation (with implication of moving down to assimilate the text). On the other hand, for inductive or bottom-up structuring, the meaning lies in the text (examples provided first), spreading upward to higher level generalizations (11:4).

Orwig, another author writing in this area, recommends similar approaches for applications using computerized instruction (19:43-44). The deductive method, which Orwig calls "RULEG" ("rule before example"), prescribes that a rule be taught first, followed by examples. This is the normal approach in top-down structuring.

Orwig uses the acronym "EGRULE" ("example before rule") to describe bottom-up or inductive structure. In EGRULE, examples are presented first, followed by the rules or concepts which the examples illustrate.

Orwig suggests the EGRULE structure should be used when the student is encountering new material. On the other hand, if the student is working with familiar material, the RULEG structure is, in Orwig's view, more effective than EGRULE (19:43-44).

Orwig's discussion suggests that the criterion which affects the choice of one or the other curriculum structure is whether or not the student has prior knowledge about material to be learned. This view is a popular one, promoted by such leading educators as David Ausubel, who once said, "The single most important factor influencing learning is what the learner already knows" (18:40). However, the literature indicates that other variables besides past knowledge may affect how individuals respond to either of the two structures. One of those variables is the way each learner's mind processes information. The field of cognitive science has explored this theory, which is discussed in the following paragraph.

Cognitive scientists, in general, view the human mind as a complex system that receives, stores, transfers, and transmits information (22:1). An important corollary assumption to this view is that a basic science of information processing is possible (22:5). This has led cognitive scientists to perform research in hopes of discovering general (explanatory) principles of information processing in humans. Through these efforts, however, they have recognized that the assumption that a general model is possible directly conflicts with the tremendous variability known to exist in human thought (22:5). Such evidence, which suggests that no two minds process the same way, has

raised doubt as to whether principles of human information processing can be found to hold across all cultures (22:5).

Types and Characteristics of Effective CBI Programs

The vocabulary used to describe instruction "delivered" by computers is not standardized in the literature. Some authors use the acronym CAI to mean "computer aided" instruction or "computer assisted" instruction. Others use the acronym CBI (computer-based instruction) to signify any instruction that is delivered by means of a computer. For this research, the acronym CBI will be used throughout the following discussion of the literature, since it is a broad term that subsumes the other terms.

Types of CBI. Kemner-Richardson's work defines the following six types of CBI, classifying them by their uses and the ways students interact with them. The decision for selecting the type best suited for this research is discussed in Chapter III.

Informational. An informational CBI program treats the computer as a database containing information, text, graphics, and other forms of data. Informational programs are most often used as supplements to more conventional forms of instruction rather than as self-contained instruction (14:19).

Drill and Practice. Drill and practice CBI programs are designed to help individuals review, reinforce, or

relearn a skill. As with informational CBI, drill and practice is most often used to supplement conventional instruction methods (14:27).

Tutorial. Tutorial CBI programs use the computer to present the complete instruction. Knowledge acquisition and comprehension are the goals of tutorial CBI (14:27).

Simulation. Simulation CBI packages are designed to provide students with practice in learning to handle job related situations (14:22).

Inquiry. Inquiry CBI combines the characteristics of informational and tutorial CBI. With this type of program, students have more control over the program, essentially selecting what they want to learn (14:24).

Intelligent. A technology not yet fully developed, intelligent CBI establishes a dialogue between the student and computer, much as a human teacher can understand and answer student questions in a conventional classroom (14:24).

Because this research project focuses on the effects which different curriculum structures may have on students in a CBI setting, it is important to review literature related to effective use of CBI.

Characteristics of CBI. In a technical report completed in 1986 for the US Navy, Hamel and Clark established human factors guidelines for the development of computerized instruction (13:1-20). In this comprehensive review of

existing CBI design literature, the authors identified five principles as the focal points for good computer instructional design:

1. Brevity. This recommendation suggests that the information a student must maintain in short term memory or attend to during the instruction should be minimized (13:3). The recommendation is based on the notion that humans have a limited capacity to process quantities of information. Design considerations here include limiting the number of text lines per screen or "page" to seven, and limiting as well the amount of highlighted material on a page to no more than 10 percent of the screen display (13:16).

2. Consistency. Task demands should be consistent within a training system in order to develop user expectations (13:3). Since students must develop a correct mental model of the system they are working with, they should spend most of their time learning the material in the lesson, not in figuring out the CBI system itself. Considerations include consistent use and placement of labels, symbols, and instructions, and consistent formatting of functionally similar screens (13:17).

3. Flexibility. Flexibility is referred to using a computer system's ability to accommodate individual differences among students (13:4). While the focus here

is on computer program development which includes review and branching (moving to different parts of the CBI at will), considerations for self-pacing through the lesson may also be an advantage (13:18).

4. Compatibility. This recommendation means minimizing information processing between stimulus and response. Additionally, input and output formats must be compatible with each other and should be compatible with established behavior patterns of the student using the system (13:4). A minimum of translation, decoding, and other forms of cognitive processing should be necessary in order to understand the information presented and to know how to respond when required. Considerations include designs which provide instructions on how users should respond, and using titles, not numbers, to label screens (pages) of the lesson on the screen (13:19).

5. Responsiveness. This guideline suggests that optimal timing of system responses to student input will help students know where they are and what they have done (13:5). Though the design focus is on interactive instruction modes which use questions embedded in the CBI (along with correct/incorrect feedback to student responses), other considerations include the CBI taking no more than five seconds to fill the screen (13:20).

An additional consideration in the development of CBI is the color scheme of the screen layout. Research performed at the Air Force Institute of Technology found that when presented with a number of color options, users preferred white text on a blue background (21:44).

Performance Testing

For the purpose of this research, performance testing entails having the student complete a quiz over material covered in CBI lessons. The following discussion pertains to general performance measurement regardless of the type of medium used to deliver the instruction.

It is important in an education setting to determine, in some systematic way, whether learners have been altered by a set of learning experiences. Testing can be viewed as a systematic sampling of an individual's characteristics at a given time under specified conditions (10:387), and although not an ideal performance measure, testing is the most widely used method to discover whether a student has mastered course content (7:144-146).

Of course, educators recognize the limitation of testing. According to Bloom,

The rather intangible quality of education [learning], the difficulty of determining whether the teacher's efforts have had some effect, and the search for some tangible evidence of the consequences of instruction have frequently led to the use of examinations as a source of evidence and reassurance needed by the teacher. (10:393)

Nonetheless, Bloom indicates that the feedback from examinations may help teachers identify strengths and weaknesses in the curriculum and in the learning experience. In sum, examinations should not be considered an end in themselves but a process by which the educational process can become more effective (10:395).

The internal validity of tests is crucial if an accurate measure of student learning is to be achieved (7:150-51; 10:37-38; 24:11). Efforts to eliminate errors in construct validity are essential, but instructors should first ensure that performance measures are defined before developing lesson plans and instructional materials. In this way, they can design tests which focus more on performance objectives (content validity) than on the effects an instructor (whether human or CAI) has on the learning environment (10:37).

According to Wergin, one of the important issues facing test developers is how to maximize two criteria. The first, control, is the need to ensure comparability across students by requiring them to respond to identical test stimuli and assessing their responses equally and fairly. The other issue, relevance, pertains to congruence between the skills required to perform well on a test and the knowledge or skills required to accomplish learning objectives. Unfortunately, the two goals tend to be mutually exclusive since tests which score high in control (such as multiple

choice tests) typically score low in relevance. As a result, the debate continues over the use of objective (verifiable truths) versus subjective (opinion oriented) tests for measuring learning performance (24:6-9).

Objective Testing. Should it appear that subjective testing using multiple choice questioning is the most appropriate performance measurement tool, several problems need to be avoided in developing multiple choice questions. Although Emory discussed the following problems in the context of developing multiple choice opinion surveys, these issues appear to be equally relevant in designing an examination for the purpose of determining the effect of CBI instruction. They are described below as problems to avoid.

1. The list of response choices may not be exhaustive. That is to say, respondents may want to give an answer that is not one of the choices presented. For example, a respondent may be looking for an answer which combines two of the choices offered and, as a result, considers both answers correct (8:219).
2. Alternatives may not be mutually exclusive. A respondent may see some of the answers as being equally plausible (8:219).
3. Alternatives offered for answering a question may not be reasonable (i.e., not possible answers to the question) (8:220).

4. The order of the possible answers may create unintentional bias because the placement of correct answers falls into a pattern (8:220).

5. Responses to questions may not represent a one-dimensional scale. Therefore, in practice, alternatives should represent different aspects of the same conceptual dimension (8:220).

Summary

This chapter has reviewed the literature in three important areas. First, the characteristics which differentiate inductive or bottom-up versus deductive or top-down structures were identified. Then the types of CBI were reviewed as possible candidates for use in the research, along with human factors issues to be considered in the development of an effective CBI program. Finally, performance testing literature was reviewed to provide not only the rationale for using performance testing as a measure of learning, but also to establish guidance for developing objective tests. The review of these three areas has laid the foundation for developing both the CBI and performance test for this research.

III. Methodology

As stated in Chapter I, the research described in this report sought to identify the correlation, if any, that exists between CBI curriculum structure and the variables of performance test, course completion time, and student attitude about the lesson structure.

The major steps of the methodology consisted of choosing the type of CBI approach to use, selecting the research population and course content for the study, developing the top-down and bottom-up versions of the course and related exam and attitude survey, administering the experimental sessions and collecting the results, and interpreting the results. This chapter describes the methods used to accomplish each of these steps.

Selecting the CBI Type

Two of the CBI types described in Chapter II were suitable candidates for this study: tutorial and inquiry. Both of these types are intended to present complete instructional packages to students who have no prior knowledge of the lesson content, and neither requires equipment or programming technology that was not available to the investigator. Of the two, tutorial CBI was selected. Tutorial is the more fundamental of the two candidates, and the research requirement to control the students' progress

through the lesson made the branching characteristic of inquiry CBI unsuitable.

A second reason why a tutorial approach is appropriate is that students needed to achieve what Krathwohl, Bloom, and Masia call a "knowledge" level of learning in order that their mastery could be measured by a post-course performance test. According to Krathwohl, et. al, the knowledge level

involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting. For measurement purposes, the recall situation involves little more than bringing to mind the appropriate material. Although some alteration of the material may be required, this is a relatively minor part of the task. The knowledge objectives emphasize most the psychological processes of remembering. (15:185)

On the assumption that remembering is the foundation of all other levels of learning that involve conscious choices, and because of the time constraints imposed for completing the study, the knowledge level of learning applied in the tutorial mode was determined to be the best available choice.

In addition, to avoid making the tutorial CBI program merely an electronic page-turning exercise, questions were embedded in the text throughout the top-down and bottom-up structured lessons. These self-test questions anticipated the questions students would receive at the end of the lesson, and were developed in accordance with planned knowledge objectives and curriculum design theories (as reviewed in Chapter II) before programming began. Because

it is the structure of the lesson, not the content, which differentiates the two program structures, development of only one set of embedded questions was necessary. These questions were then inserted at the appropriate place in each lesson structure.

Selecting the Research Population and Course Content

Selecting the research population and course content are obviously interrelated activities, since content should be appropriate for the learners who will study it. The research population for the study consisted of Air Force officers enrolled at the Air Force Institute of Technology. This population was selected for both practical and theoretical reasons. On the practical side, the population was available to the investigator at the time it was needed. In addition, the population consisted of individuals whose general aptitude was known from the admission criteria used by the Institute. This fact suggested theoretically that strong differences in ability would not be a confounding variable in the study's results. These students were also enrolled in related courses of study, increasing the likelihood of choosing content for the CBI course that would have equal appeal to all members. And finally, the participants' backgrounds were known, so that content could be selected that would be new to them, thus minimizing the influence of prior knowledge on the results.

The primary content of the course was material selected from the textbook used in AFIT course CMGT 523, Contract and Acquisition Management (2:13-1 to 13-20). This material consisted of topics in the areas of inspection, acceptance, and warranties in government contract administration. Additional literature sources were used to supplement the CMGT 523 text to enhance definitions and provide examples which demonstrate contract administration principles (3:551,583; 23:9-1 to 9-15).

Developing the CBI Lessons and Related Material

The following process was used to develop the CBI lessons, the performance test, and the attitude survey. Checkpoints were injected throughout this process to ensure that factors such as the consistency between the two lesson structures and internal validity of measurement devices prevailed.

CBI Development. The following steps were completed during the development of the CBI:

1. Once the learning material for the lesson had been selected, main concepts were identified as the learning objectives for the lesson. These concepts were formulated in a tree diagram so they could be viewed in the manner in which they would be presented to research participants.

2. Details surrounding the development and introduction of main concepts were added as the top-down and bottom-up lessons were written. Top-down or deductive and

bottom-up or inductive structuring techniques, as described in the literature review in Chapter II, were constantly reviewed for compliance during this step. Therefore, the focus at this point was to ensure that the curriculum structure, not the content of the learning material itself, was the differentiating factor between the two lesson forms. In addition, clear transitions from concept to concept were viewed as an important outcome. The completion of this step created a product which would be appropriate for use in a textbook on contract administration.

3. With the basic lesson versions in hand, the transfer process to computer instruction followed. The computer code was written in BASIC programming language for its ease of use and familiarity to the faculty member advising the project. During the transition to computer program form, an effort was made to streamline each lesson into a more bulletized fashion. This was done to eliminate extra wording which, though not necessarily detrimental in a textbook, could unnecessarily lengthen the CBI. This was especially important since the targeted length for the CBI, in either curriculum structure, was sixty minutes. Beginning with this step and continuing through the remainder of steps in the CBI development, each lesson was executed (run) on the computer and debugged as necessary.

In addition, the lessons were programmed so that students could not re-accomplish any portion of the CBI

prior to completing the performance test. This was done to add assurance that only curriculum structure would be the factor affecting the dependent variables of the research (performance test score, course completion time, and learner attitude about the lesson). Finally, Kemner-Richardson's guidelines for effective CBI, as discussed in Chapter II, were implemented wherever possible.

4. Once each lesson was coded, a final line-by-line comparison of the two program versions was completed to ensure that the content, and even emphasis on particular ideas and concepts, was comparable between them. Differences outside the desired result of curriculum structure were eliminated to prevent additional factors from affecting the dependent variables of the research.

5. At this point the introduction and end-of-lesson screens were developed. In addition, questions to be embedded in each lesson were developed and inserted where appropriate. As mentioned earlier only one set of nine embedded questions was required since the course material within each lesson was the same--only curriculum structure was different between lessons.

6. With both top-down and bottom-up CBI lessons complete, the next step involved error-checking to make sure both correct and incorrect keystrokes were adequately managed within the coded programs. Once each lesson was thoroughly checked out, a master copy of each was made. Six

duplicate copies of each lesson, five primary and one backup, were made for the conduct of the experiment. AFIT computer resources in building 641 on Wright-Patterson AFB were used to execute the experiment.

Appendices A and B contain the BASIC program for the top-down lesson and bottom-up lesson respectively.

Experimental Design. A post-test-only control group design was chosen for the research. Blocking techniques, useful in eliminating the effects of confounding factors, were not included in the design. This is because the investigator felt any factors which might affect the research had been accounted for and reasonably controlled. Pretests were also assumed unnecessary considering, 1) the investigator's extensive use of randomized processes throughout the design of the experiment, and 2) the AFIT selection criteria described earlier (which produces a homogenous population of students from which to draw). As a result, a single performance test was developed using knowledge level objectives defined earlier in this chapter.

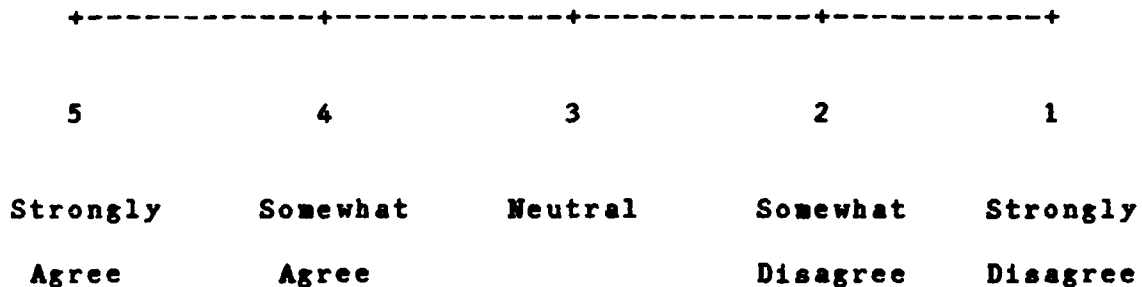
Performance Test Development. Emory's recommendations for creating objective (multiple-choice) questions, outlined in Chapter II, were the cornerstone of performance test development. To ensure identical lesson content while producing the CBI, a line-by-line analysis was done to ensure that answers to each question were identically defined and highlighted within each structure. The result of the performance test

development effort was a twenty question multiple-choice test, attached in Appendix C.

Finally, a technique for randomly ordering the questions was chosen. Using the top-down lesson (the bottom-up structure could have been used just as well), questions were ordered based on where they were discussed from the beginning to the lesson's end. Using the middle of the lesson as a starting point, the question which lay closest to that middle was selected as the first item for the performance test. Then, selecting questions alternately from one side and then the other side of the middle of the material, the remainder of the questions were ordered. The result was a structure of question-asking which favored neither the top-down or bottom-up lesson structures, thus eliminating one more factor which could have affected the outcome of the research.

Attitude Survey Development. To collect user attitudes about the lessons, a summated scale survey, in particular the Likert Scale, was chosen for its appropriateness to the research design and ease of application. To develop the survey, the investigator followed Emory's recommendations for judging each statement in the survey. Each survey statement must, 1) be relevant to the attitude being studied, and 2) reflect both a favorable and unfavorable position on that attitude (8:256). A five point scale was

chosen for the survey, with attitude choices ranging as shown below:



The statements for the survey were developed within the four subject area categories identified below.

1. Structure. This category sought feedback on the curriculum structure of the program and the ease with which the participant was able to learn using that structure. An additional consideration for this subject area was the participant's ability to complete the quiz.

2. Content. This category considered the content of each structured lesson as well as the adequacy in the levels of detail (and definitions) used to help participant's learn the material.

3. User Friendliness. This category sought to determine each participant's perception on the clarity of the instruction, identify a preference or lack thereof for CBI, and provide feedback on whether the participant would like to take another course offered in an identical manner.

4. Screen Appearance. This final category was designed to determine whether or not the participant liked the appearance (ease of reading screens, etc.) of the screens. This area was developed to determine if the appearance of the CBI hindered student performance.

The completed version of the attitude survey, located in Appendix D, contained sixteen scoring statements and two comment areas (where participants could provide additional feedback about the lesson).

Sample Experiment Session. Once the course, performance test, and attitude survey were complete, the next logical step appeared to be inviting participation in the research. However, before administering group experimental sessions in the manner described in the following paragraphs, a sample session was conducted using one volunteer student. This was done to obtain an estimate of how long it would take other students to complete the CBI, performance test, and attitude survey. The estimated times were then used to schedule computer resources and provide volunteers with reasonably accurate estimates of how long they could expect the experiment to last.

The bottom-up lesson was selected for the student since it was physically 13.2% (in terms of disk storage space) longer than the top-down lesson and would possibly provide an upper-ended time estimate for the exercise. The sample student completed the CBI portion in 26 minutes, the

performance test in 6 minutes, and the survey in 8 minutes for a total time of 39 minutes. This estimate proved to be very accurate during the actual conduct of the experiment. As a result, computer resources were better scheduled and students were left with positive impressions when they actually completed the session in less than the hour they were told to expect.

Administering the Experimental Sessions

The following steps were accomplished during the preparation and conduct of the research experiments.

Step 1. Scheduling Participants. Scheduling participants involved reserving the computer laboratory (room 315) in AFIT/LS and canvassing for volunteers.

Step 2. Random Assignment. Random assignment involved using a pseudorandom number generator function in MATHCAD Version 2.0 (1:96-97) to randomly assign a lesson structure to each computer terminal, a lesson structure to each volunteer, and a location within the computer laboratory where each volunteer would sit. Given that ten Zenith computer terminals were available at one time in the laboratory, five terminals were assigned to each of the two lesson structures.

Step 3. Experiment Set-up. Experiment set-up involved preparing the computer laboratory and ensuring both materials used and measurements taken for each of the participants were accurately tracked during the experiment.

To meet this latter purpose, the researcher kept a journal which detailed where volunteers and specific experiment materials (computer disks, etc.) were located. In addition, cover sheets for booklets containing the performance test and survey were coded to indicate whether the results within the booklet were the result of top-down or bottom-up lesson execution. This code was transparent to the participants; the date form "July 19, 1990" was used for top-down participants while the form "19 Jul 90" was used for bottom-up participants. Once program disks were loaded into their designated computers, the booklets were put inside envelopes and placed beside the terminal. Each CBI lesson disk was then run through a final check to be sure it performed without error. Monitors were then cleared to reveal a blue screen, giving an identical appearance to all computer stations.

Step 4. Conduct. Conduct involved welcoming participants into the experimental setting, ensuring they were properly seated, and briefing them on conduct of the experiment. Once participants were given a signal to begin, an elapsed time was started and tracked in one-minute increments. These increments were written on a marker board at the front of the laboratory until the last participant completed the computer portion of the exercise. As soon as they finished their CBI lesson, participants were instructed to write this elapsed time on the cover of the booklet

located in the envelope beside their terminal. This data was then used to assess the impact, if any, that lesson structure had on course completion time.

Step 5. Data Collection. Data collection involved collecting data provided by the participants and returning the computer laboratory to its pre-experiment configuration.

Data Analysis

The initial stage in the data analysis involved determining the type of data available from the experiment. That is, which of the four common classifications was appropriate: nominal, ordinal, interval, or ratio (8:87). The scores from the performance testing and course completion timing were treated as interval-level data. However, classification of the Likert scale scores was not quite as straightforward.

Some authorities hold that Likert scales produce ordinal data only (8:258), while others hold that if a survey is well enough prepared, distinctions about how much more or less favorable a respondent feels about a topic can be determined from this scale (9). This research was built on the later argument, and as a result the data obtained from the Likert scale survey was treated (assumed) as interval-level data. This enabled the investigator to have the option, before analyzing the data, of using either parametric or non-parametric statistical test procedures. However, parametric procedures require the data to be

normally distributed, while non-parametric procedures are less restrictive and are often simultaneously valid for many different types of data distributions (5:592). Therefore, selecting the most appropriate procedure would depend, as the following paragraphs indicate, on the distributions of the research data.

The top-down and bottom-up data were organized into eighteen analysis areas: the performance test scores, the course completion times, and the sixteen scoreable statements of the attitude survey. A Wilk-Shapiro test for normality using STATISTIX (17:8.4), a statistical analysis programming tool, was performed for the top-down and bottom-up data in each set. Applying the criterion that the statistic produced by the Wilk-Shapiro test be must at least 0.9 in order to classify data as normally distributed, only two of the (36) distributions qualified. Further, none of these analysis areas had both data sets pass the normality test. This left, for instance, normally distributed top-down performance test data to be compared with bottom-up performance test data which was not normally distributed. Devore offers a solution to such situations, indicating that distribution-free procedures perform almost as well as t and F-tests used for normally distributed data, and can offer considerable improvement under non-normal conditions (5:592). For this reason the investigator chose to pursue non-parametric analysis for the research data. With this

decision, the investigator turned to deciding which non-parametric test was most appropriate.

As stated earlier, two sub-populations (out of the general AFIT population) were created by the post-test randomized design used to measure the effect of curriculum structure (a single factor). According to the literature, there are a number of non-parametric tests which can be used to analyze such designs (5:592). The key assumption in many of these tests is that observed scores (data values) are drawn from an underlying continuous, versus discrete, distribution; this assumption of an underlying continuum is especially important for those tests which require at least ordinal-level data (20:25). Proper classification of the data requires understanding the distinctions between continuous and discrete random variables. According to Siegel,

A discrete variate [random variable] is one which can take on only a finite number of values; a continuous variate is one which can (but may not) take on a continuous infinity of values. (20:25)

By this definition, the performance test and course completion time data fit in the category of continuous distributions. The attitude survey results are also continuous because, once again referencing Siegel, even though the measurement points of the survey were predefined points on a (Likert) scale, it is reasonable to assume that an underlying continuum exists for that data (20:25).

These descriptions of the experimental design, along with the assumption of an underlying continuum fit the criteria for application of the Kruskal-Wallis Test, a distribution-free analysis of variance (5:622). Therefore the Kruskal-Wallis Test was used to analyze each of the eighteen analysis areas described earlier.

In this analysis, the investigator did not initially assume a significance level (α) which might correlate with a level the reader would consider appropriate. Instead, the key outcome in any of the Kruskal-Wallis tests was the p-value. This value was then used to determine the smallest level of significance at which a null hypothesis could be rejected, thereby allowing the reader to determine the significance of the data. Later, the investigator used a p-value of 0.1 as a significance indicator for conclusions drawn in Chapter VI (Conclusions/Recommendations).

The results of using the analysis methods described above are reported in the next chapter.

IV. Results

Introduction

This chapter presents the raw data and corresponding descriptive statistics collected from the research experiments as described in Chapter III. As that chapter indicates, the primary data consisted of each participant's performance test scores, (CBI) course completion time, and attitude survey scores.

Three experimental sessions were conducted in order to accommodate the 24 students who volunteered to participate. Twelve students apiece were randomly assigned into both the top-down and bottom-up structured lessons. However, a malfunction of the video display during one of the bottom-up CBI lessons, which the participant did make the investigator aware of until after the experiment, was significant enough to adversely affect that participant's view of the lesson, thereby warranting elimination of that data from the results. This left the two randomly assigned populations uneven. To balance the populations for statistical analysis, the investigator randomly selected one top-down participants' data and excluded it from these results, leaving 11 participants in each lesson structure.

Performance Test and Course Completion Time Results

Table 1 provides performance test scores and timing data for each of the 22 participants. Completion times are in

minutes, while test scores reflect a percentage, on a scale of 0-to-100, of correct responses to the 20-question quiz.

TABLE 1
CBI PERFORMANCE TEST AND COURSE
COMPLETION TIME RESULTS

<u>STUDENT</u>	<u>CURRICULUM STRUCTURE</u>	<u>PERFORMANCE TEST SCORE (percent)</u>	<u>COMPLETION TIME (minutes)</u>
1	B	80	25
2	B	60	19
3	B	90	18
4	B	90	17
5	B	75	23
6	B	90	19
7	B	90	23
8	B	90	21
9	B	85	17
10	B	70	25
11	B	80	21
12	T	95	20
13	T	90	27
14	T	80	22
15	T	80	17
16	T	90	13
17	T	65	22
18	T	90	19
19	T	80	19
20	T	80	19
21	T	75	18
22	T	65	19

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure

To validate the time data, the investigator randomly chose two participants in each experiment session and monitored their CBI completion time for later comparison with the time they documented on their test booklets. In each case the participants recorded their times accurately.

Likert Scale Survey Results

As Chapter III indicated, there were 16 survey items for each participant to score using the Likert Scale. Table 2 indicates the scores applied by each of the 22 participants.

TABLE 2
ATTITUDE SURVEY RESULTS

STUDENT	SURVEY STATEMENT															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1-B	3	4	4	4	3	4	4	4	4	3	4	4	4	4	2	4
2-B	3	2	3	3	2	4	4	4	4	3	4	3	3	4	3	2
3-B	3	5	4	4	4	4	5	4	5	4	4	4	4	4	2	5
4-B	2	3	4	4	4	4	5	5	5	4	4	4	4	4	2	5
5-B	3	4	4	2	4	5	5	5	5	5	M	M	M	M	M	M
6-B	2	4	5	4	5	2	5	5	5	4	5	5	5	5	2	5
7-B	3	5	5	4	5	3	5	5	5	5	5	4	5	5	2	5
8-B	M	4	5	4	4	5	4	5	5	4	4	5	4	4	2	4
9-B	3	2	3	4	4	5	3	5	5	3	5	5	5	5	2	3
10-B	3	4	4	2	5	3	5	5	5	5	4	3	4	4	3	5
11-B	2	3	4	3	4	2	4	5	5	3	5	4	4	4	3	4
12-T	3	4	4	3	4	4	4	4	5	4	M	4	4	4	2	4
13-T	3	4	4	4	4	4	4	4	4	4	4	3	4	4	2	4
14-T	3	4	4	4	4	4	5	3	5	4	4	4	4	4	3	5
15-T	2	5	4	5	4	3	4	5	5	4	4	5	5	5	3	4
16-T	2	3	4	4	4	5	4	4	5	4	4	4	4	4	3	4
17-T	3	4	4	3	4	2	4	4	4	4	4	3	4	4	3	4
18-T	1	5	4	4	4	3	5	5	5	4	4	4	5	5	2	4
19-T	3	4	4	4	4	4	4	4	4	4	M	M	M	M	M	M
20-T	1	4	4	4	4	1	5	5	5	4	5	4	3	4	4	4
21-T	3	4	4	4	3	1	4	4	5	2	4	3	5	3	4	4
22-T	3	4	4	4	4	3	4	5	5	4	4	4	4	4	3	4

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure
M = Missing

The 16 statements are labeled as they appeared in the actual survey. Results from the scoring ranged from a high of 5 (strongly agree) to a low of 1 (strongly disagree).

Statements k and r do not appear in Table 2 since they were comment response items for the survey. Responses annotated "M" (for "missing") indicate where a participant, for unknown reasons, did not respond.

Survey Comments. The attitude survey gave each of the 22 participants 2 opportunities (items k and r) to write in comments about the CBI, performance test, and survey. Though 44 written responses were possible, only 5 responses were provided. While the comments are reproduced verbatim in Appendix E, the gist of each one is indicated below:

1. Too much information was presented in lesson paragraphs, making reading difficult.
2. Anticipation of concepts was not possible due to a lack of familiarity of the subject matter.
3. The CBI offered no advantage over reading a paper text, especially since computer graphics and an ability to back-track in the program were not provided.
4. Paper copy allows back-tracking if necessary. The program's use of paragraph structure and lists made the lesson seem less intimidating (than a screenful of text).
5. Highlighting main concepts, and a facility for back-tracking, would have improved the lesson.

Descriptive Statistics

The interactive statistical programming tool STATISTIX was used to calculate descriptive statistics on the data presented in the following paragraphs.

Performance Test and Course Completion Time. Table 3 shows the statistics which describe the performance test and course completion time results. Eleven measurements for each lesson structure are provided for each variable. Mean scores for top-down and bottom-up test performance test scores were 80.91 and 81.82 respectively. Course completion time averages were 19.55 for the top-down lessons and 20.73 for bottom-up lessons.

TABLE 3
STATISTICS FOR PERFORMANCE TEST AND COURSE COMPLETION TIME

<u>VARIABLE</u>	<u>CURRICULUM STRUCTURE</u>	<u>SAMPLE SIZE</u>	<u>MEAN</u>	<u>STD DEV</u>	<u>MEDIAN</u>
PERFORMANCE TEST SCORE	B	11	81.82	10.07	85
	T	11	80.91	9.95	80
TIME (MIN)	B	11	20.73	2.97	21
	T	11	19.55	3.48	19

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure

Attitude Survey. Before these statistics were calculated, the investigator attempted to negate the sample size imbalance caused by the non-response areas (labeled "M") seen in Table 2. This was done by randomly selecting a response in the larger set and removing that response from the results. Specifically, one top-down response on item "a" (the value 2), and one bottom-up response on item "1" (the value 5) were deleted. Non-response areas "1 through

q" by participants 5 and 19, occurring in bottom-up and top-down results respectively, were treated as though they balanced each other; therefore no random deletions were necessary in those instances. The results of this data handling are reported in Table 4.

TABLE 4
STATISTICS FOR ATTITUDE SURVEY RESPONSES

<u>SURVEY QUESTION</u>	<u>SAMPLE SIZE</u> B / T	<u>MEAN</u> B / T	<u>STANDARD DEVIATION</u> B / T	<u>MEDIAN</u> B / T
A	10 / 10	2.70 / 2.50	0.48 / 0.85	3 / 3
B	11 / 11	3.64 / 4.09	1.03 / 0.54	4 / 4
C	11 / 11	4.09 / 4.00	0.70 / 0.00	4 / 4
D	11 / 11	3.46 / 3.91	0.82 / 0.54	4 / 4
E	11 / 11	4.00 / 3.91	0.89 / 0.30	4 / 4
F	11 / 11	3.73 / 3.09	1.10 / 1.30	4 / 3
G	11 / 11	4.46 / 4.27	0.69 / 0.47	5 / 4
H	11 / 11	4.73 / 4.36	0.47 / 0.67	5 / 4
I	11 / 11	4.82 / 4.73	0.40 / 0.47	5 / 5
J	11 / 11	3.91 / 3.82	0.83 / 0.60	4 / 4
L	9 / 9	4.33 / 4.11	0.50 / 0.33	4 / 4
M	10 / 10	4.10 / 3.80	0.74 / 0.63	4 / 4
N	10 / 10	4.20 / 4.20	0.63 / 0.63	4 / 4
O	10 / 10	2.40 / 2.80	0.70 / 0.63	2 / 3
P	10 / 10	4.30 / 4.10	0.82 / 0.32	4 / 4
Q	10 / 10	4.10 / 4.20	0.99 / 0.42	4 / 4

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure

The following chapter presents the analysis of the experimental results described in this chapter.

V. Analysis

This chapter analyzes the data presented in Chapter IV. The analysis consisted of establishing the normality of the data distributions, performing hypothesis tests, and identifying the effect the research variables might have on one another.

Data Distribution Analysis

A Wilk-Shapiro normality statistic was calculated for the top-down and bottom-up data pairs analyzed for each of the research variables.

Performance Test and Course Completion Time. Table 5 shows the results of the normality test performed for these data sets. This analysis indicates that only one data set in each qualifies as normally distributed (using the 0.9 statistic criteria from Chapter IV), thereby eliminating parametric test procedures from use later in this analysis.

TABLE 5

WILK-SHAPIRO NORMALITY OF PERFORMANCE TEST AND TIME DATA

<u>DEPENDENT VARIABLE</u>	<u>CURRICULUM STRUCTURE</u>	<u>NORMALITY STATISTIC</u>
PERFORMANCE TEST	B	0.8339
	T	0.9143
COURSE COMPLETION TIME	B	0.9398
	T	0.8907

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure

Attitude Survey. Table 6 shows the results of the normality test performed for the attitude data. This analysis was done for each of the sixteen scored items of the survey. The statistic values range from a low of 0.3119 to a high of 0.9080. The value "M" for the top-down analysis in the third survey statement indicates that a condition of non-normality prevented calculation of the statistic. As the table indicates, only one top-down data set met the criteria for a normal distribution, leading the investigator to conclude that hypothesis tests with this data were best conducted with non-parametric (distribution-free) test procedures.

TABLE 6
WILK-SHAPIRO NORMALITY OF ATTITUDE SURVEY DATA

<u>SURVEY STATEMENT</u>	<u>WILK-SHAPIRO STATISTIC</u>	
	<u>BOTTOM-UP</u>	<u>TOP-DOWN</u>
A	0.6146	0.6396
B	0.8913	0.6944
C	0.8329	M
D	0.7045	0.6944
E	0.8158	0.3119
F	0.8996	0.9080
G	0.7606	0.5887
H	0.5887	0.7911
I	0.4827	0.5887
J	0.8487	0.3119
L	0.6424	0.3570
M	0.8484	0.7869
N	0.7869	0.7869
O	0.6439	0.7869
P	0.8051	0.3326
Q	0.8310	0.5095

Tables 5 and 6 demonstrate that none of the data pairs had both values meet the normality criteria. This result, along with the randomized design and the assumption that the data is continuous, led to the application of Kruskal-Wallis (non-parametric) statistical test procedures. That analysis is presented in the following paragraphs.

Kruskal-Wallis Hypothesis Testing

The null hypothesis evaluated for each of the (eighteen) data pairs identified in Tables 5 and 6 was stated as follows: the mean from the top-down distribution equals the mean from the bottom-up distribution. Said another way, the means came from the same distribution, indicating that curriculum structure did not cause a significant difference in the outcomes measured during the research. The alternate hypothesis stated that the means were not equal, leading one to conclude that the data created as a result of curriculum structure was significant.

The Kruskal-Wallis analysis was reported as p-value calculations in each of the tests performed. As Chapter III pointed out, the p-value establishes the smallest level at which a null hypothesis can be rejected. By reporting the results of the analysis in this manner, the reader was given the opportunity to set the data significance criteria as he or she saw fit. As for the investigator's criterion, a significance factor of 0.1 was applied in the analysis.

Performance Test and Course Completion Time. Table 7 shows the Kruskal-Wallis analysis for performance test and course completion time data, the p-values of which were 0.8118 and 0.4645 respectively. Using a 0.1 significance level led the investigator to conclude that the null hypothesis, for both research variables, should not be rejected. The average scores from the performance test do not allow one to conclude, given 0.1 significance, that curriculum structure caused them to be significantly different from one another. Similar results were found in the analysis for course completion time.

TABLE 7
KRUSKAL-WALLIS ANALYSIS FOR
PERFORMANCE TEST AND COURSE COMPLETION TIME DATA

<u>RESEARCH VARIABLE</u>	<u>MEAN VALUES</u>		<u>P-VALUE</u>	<u>SIGNIFICANT</u>
	<u>BOTTOM-UP</u>	<u>TOP-DOWN</u>		
PERFORMANCE TEST SCORE	80.91	81.82	0.8118	NO
COMPLETION TIME (min)	19.55	20.73	0.4645	NO

Attitude Survey. Table 8 shows the Kruskal-Wallis analysis for the Likert scale attitude survey. P-values for these tests ranged from a low of 0.1311 to a high of 0.9695. Further, a value marked "tied" appears in the table to indicate a test where too many ties occurred during the Kruskal-Wallis computations, thereby preventing the report

of a p-value in that instance. As with the previous test results, the attitude analysis indicates that the data was not statistically significant (at 0.1) for any of the survey statements.

TABLE 8
KRUSKAL-WALLIS ANALYSIS FOR THE ATTITUDE SURVEY

SURVEY ITEM	MEAN VALUES		P-VALUE	SIGNIFICANT
	BOTTOM-UP	TOP-DOWN		
A	2.70	2.50	0.7784	NO
B	3.64	4.09	0.2828	NO
C	4.09	4.00	0.6218	NO
D	3.46	3.91	0.1881	NO
E	4.00	3.91	0.4504	NO
F	3.73	3.09	0.2478	NO
G	4.46	4.27	0.3498	NO
H	4.73	4.36	0.1715	NO
I	4.82	4.73	0.6192	NO
J	3.91	3.82	0.9695	NO
L	4.33	4.11	0.2705	NO
M	4.10	3.80	0.3347	NO
N	4.20	4.20	TIED	NO
O	2.40	2.80	0.1311	NO
P	4.30	4.10	0.3395	NO
Q	4.10	4.20	0.8662	NO

Additional Attitude Survey Analysis

While the results in Table 8 demonstrate that the survey data was not statistically significant, there are insights which can be gleaned from the way top-down and bottom-up participants either agreed, stayed neutral, or disagreed with the survey statements. Table 9 lists each survey statement and the number of participants within each lesson structure who responded in these three manners. Using the

Likert scale, agreeing answers were scored either 4 or 5, neutral answers were scored a 3, and disagreeing answers were scored either a 1 or 2. Dashes are used in the table to indicate where no response was recorded.

TABLE 9
SURVEY ANALYSIS BY RESPONSE TYPE

SURVEY ITEM	SAMPLE SIZE		% AGREE		% NEUTRAL		% DISAGREE	
	B	T	B	T	B	T	B	T
A	10	10	-	-	7	7	3	3
B	11	11	7	10	2	1	2	-
C	11	11	9	11	2	-	-	-
D	11	11	7	9	2	2	2	-
E	11	11	9	11	1	-	1	-
F	11	11	7	5	2	3	2	3
G	11	11	10	11	1	-	-	-
H	11	11	11	10	-	1	-	-
I	11	11	11	11	-	-	-	-
J	11	11	7	10	4	-	-	1
L	9	9	9	9	-	-	-	-
M	10	10	8	7	2	3	-	-
N	10	10	9	9	1	1	-	-
O	10	10	1	1	2	6	7	3
P	10	10	8	10	2	-	-	-
Q	10	10	8	10	1	-	1	-

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure

Three areas in Table 9 are of particular note. First, survey items B through E all relate to attitudes about the structure of the lessons. Top-down participants agreed more often, possibly indicating they were more comfortable and felt learning was easier given the logic of their lesson structure compared to their bottom-up counterparts. This is

interesting considering that 1) the Kruskal-Wallis test from Table 7 indicated the performance test data was not significant, and 2) the bottom-up participants averaged slightly higher scores than top-down counterparts.

Second, top-down participants generally agreed more with item J, which stated that concepts were covered in appropriate detail in the lesson. This is noteworthy for similar reasons as pointed out in the preceding paragraph, and that despite this the bottom-up participants did as well or better on the performance test than their counterparts.

Finally, when asked whether they would have learned the material in the lesson better from a paper copy (item O), bottom-up participants disagreed over two-to-one compared to their top-down counterparts. While this feedback could indicate how respondents would feel about an exact paper copy of what they saw on their monitors, it might also indicate they approved of the CBI/bottom-up curriculum structure format.

Performance Test and Course Completion Time Comparison

The following analysis was done to determine what effect, if any, might be seen when performance test measures were collated with course completion times. Table 10 summarizes data first presented in Table 1 of Chapter IV. Here, the total number of scores in relation to specified performance test and course completion time ranges are provided. Aside from a possible top-down outlier located in

the lowest time range, the bulk of the placements cluster in the sixteen to twenty-four minute time range at scores which range from 60 to 100. Much like the Kruskal-Wallis analyses discussed earlier, there did not appear to be any significant patterns within this comparison. That is, it did not appear that participants within one lesson structure tended to score in one performance test/completion time area significantly more than the other structure.

TABLE 10
PERFORMANCE TEST AND COURSE COMPLETION TIME ANALYSIS

TIME RANGE (min)	PERFORMANCE TEST SCORING RANGE							
	60 - 69		70 - 79		80 - 89		90 - 100	
	B	T	B	T	B	T	B	T
13 - 15	-	-	-	-	-	-	-	1
16 - 18	-	-	-	1	1	1	2	-
19 - 21	1	1	-	-	1	2	2	2
22 - 24	-	1	1	-	-	1	1	-
25 - 27	-	-	1	-	1	-	-	1

B = Designator for the bottom-up curriculum structure
T = Designator for the top-down curriculum structure

The final chapter presents conclusions which can be drawn from the results and analysis presented thus far. In addition, recommendations for further research are also provided.

VI. Conclusions and Recommendations

Introduction

This chapter summarizes the conclusions drawn from the analysis performed in the previous chapter, in effect answering the research question set forth in Chapter 1.

That question, restated here, is as follows:

If the same body of content is arranged in a top-down (deductive) structure and a bottom-up (inductive) structure and presented to students by computer-based instruction, what (if any) differences occur in student learning (measured by performance testing), in course completion time, and in student attitude toward the learning experience?

While the potential existed for curriculum structure to have made such differences, the statistical analysis proved otherwise for the body of material tested. Several important conclusions were drawn from this fact.

Conclusions

The outcome alluded to in the previous paragraph, that inductive and deductive structure produced similar results in learning, performance time, and user attitude, is the single most important outcome of this research. However, there may times when one or another of the three variables (performance test, course completion time, and student attitude) may be more important to an educator, in which case there are additional inferences which can be made.

This research assumes that military educators are most interested in those techniques which produce the highest

degree of learning performance for their students. This implies, then, that course completion times and student attitudes, though important, play a secondary role to student performance. Applying that criterion and the results of this research leads one to conclude that the bottom-up approach has a slight advantage over top-down structure. However, an educator may want to consider all three variables, using one variable as the primary objective with the other two of lesser (but still essential) importance. If such an approach is applied in instances where (as in this research) students are unfamiliar with the CBI learning material, then conclusions from the following "if-then" scenarios, which this research supports, are approaches educators may want to consider.

Scenario 1:

IF student performance is of primary importance--

AND IF course completion time is of lesser importance--

AND IF student attitude is of least importance--

THEN the bottom-up curriculum structure is the method of choice.

This conclusion is based heavily on performance test results, outweighing the evidence which indicated that average course completion times for the top-down structure were lower than those for the bottom-up structure. This time difference was a mere 1.18 minutes; a result that could

be partially due to the one minute increments used to document the completion times. Further, it is difficult to place much emphasis on any time advantage because the bottom-up lesson was 13.2% longer than the top-down lesson.

Scenario 2:

IF student performance is of primary importance--

AND IF student attitude is of lesser importance--

AND IF course completion is of least importance--

THEN the bottom-up curriculum structure is the method of choice.

While the performance test result was the strongest factor affecting this conclusion, another factor which supported it was the attitude survey result which indicated that bottom-up participants, by a margin of over two-to-one over top-down participants, disagreed with the statement that they would have learned the lesson better from a paper copy. This may be an important realization for CBI designers. However, when student attitude is the variable of primary importance, and other key attitude survey results are considered, a different conclusion is warranted, as seen by the following scenario.

Scenario 3:

IF student attitude is of primary importance--

AND IF student performance is of lesser importance--

AND IF course completion times are of least importance--

THEN the top-down curriculum structure is the method of choice.

While the bottom-up participants indicated, by the two-to-one margin referenced earlier, that they would not have learned the lesson better from a paper copy, the top-down participants gave the strongest indications that they were generally more comfortable with the lesson, and felt they learned better, than those students randomly assigned to the bottom-up lesson. In addition, the average results within each structure for either the performance test (student learning) or course completion time were so close that the investigator felt they become non-players when student attitude is the primary educational objective.

The previous scenarios are obviously not meant to be exhaustive in nature, but are provided as a guide which the reader can use to determine an appropriate curriculum structure for a number of different applications. The recommendations of the following paragraphs are an outgrowth of those scenarios.

Recommendations

The comments provided by participants as part of their attitude survey responses indicate that an ability to back-track through previously covered material would have improved the CBI lessons. For obvious reasons, this research design could not permit backtracking since this would allow participants to restructure the material, when the "structure" of the material was the independent variable being tested. In addition, participants indicated that highlighting of main concepts would have also been an improvement. This research did not use highlighting because of the unknown effect it might have if not equally applied to both structures. As this feedback suggests, educators should make a note to include these aspects in their CBI when possible. Had such program design aspects been possible, participants using each structure might have been even more comfortable with their randomly assigned lesson structure.

As Chapter III pointed out, the bottom-up program was physically 13.2% longer than its top-down counterpart. This difference in length is due to the essence of the bottom-up structure, which relies more on examples in leading the student toward generalizations and rules of behavior. The full effect of this difference in program length could have caused not only the differences seen in average course completion time, but might have affected the other

performance measures as well. Judgments about such effects are beyond the scope of this CBI research, suggesting an area where further investigation should be performed.

Finally, this research was designed for participants with little knowledge about the CBI course content. As the results indicate, no statistically significant differences were found which suggest that one curriculum structure promotes different (better or worse) measurements in comparison with the other. It would be valuable to know what results would be obtained for situations where the participants already had a depth of knowledge from which to work. In a similar vein, it would also be valuable to determine if the conclusions of this research apply to learning applications at other than the "knowledge" level. The investigator recommends further work in these areas as a continuance of ongoing efforts to help educators design and use computer-based instruction with maximum effectiveness.

Summary

The differences caused by top-down (deductive) and bottom-up (inductive) curriculum structures were not statistically significant in this research. This provides educators an important result in that either structure has been shown effective when the following learning variables are measured: performance (amount of learning), the amount of time to complete the learning session, and student attitude about the learning experience.

However, educators may have their own agenda as to which of the three research variables are most important. For this reason several "if-then" scenarios are discussed to aid educators in selecting the best structure for their particular application.

Appendix A: Top-down Structured Lesson

```
10 REM THIS IS THE TOP-DOWN PROGRAM STRUCTURE
20 KEY OFF
30 COLOR 14,1
40 CLS
50 PRINT
60 PRINT"                                INTRODUCTION"
70 PRINT
80 PRINT
90 COLOR 15,1
100 PRINT" Welcome to this presentation on government contracting."
110 PRINT" The material you are about to review is based on subject"
120 PRINT" matter extracted from the Federal Acquisition Regulation"
130 PRINT" (FAR) and AFIT course CMGT 523, Contracting and Acquisition"
140 PRINT" Management. This material was chosen not only for its"
150 PRINT" interest to AF managers but for its relevance to your"
160 PRINT" career field in particular. There are three parts to"
170 PRINT" this presentation:"
180 PRINT
190 PRINT"      1. The text portion using computer-assisted"
200 PRINT" instruction (following these introductions),"
210 PRINT
220 PRINT"      2. A written quiz (in the envelope beside your"
230 PRINT" computer) over the learning material in step 1,"
240 PRINT
250 PRINT"      3. A brief survey, following the written quiz, to"
260 PRINT" ask for your feedback on this presentation."
270 PRINT
280 INPUT"                                To continue, press <ENTER>","P
290 CLS
300 PRINT
310 PRINT
320 PRINT
330 PRINT
340 PRINT" The computer program itself is written like a text, but"
350 PRINT" with a SELF-TEST QUESTION occasionally inserted to help"
360 PRINT" you reinforce main points. These questions, displayed"
370 PRINT" with the same blue background you see here but with light"
380 PRINT" blue text writing, will also give you a good idea of what"
390 PRINT" to expect from the short quiz you will complete at the"
400 PRINT" conclusion of this computer portion of the exercise."
410 PRINT
420 PRINT" Your participation in this review is greatly appreciated."
430 PRINT" Though your progress through the text portion will be"
440 PRINT" timed, please work at a pace which is comfortable to you."
450 PRINT" This is not a competition to see who finishes first."
460 PRINT
470 PRINT" THANK YOU in advance for your efforts and feedback"
480 PRINT" during this exercise."
490 PRINT
```


500 PRINT

510 PRINT

520 INPUT"

To continue, press (ENTER)",P

530 CLS

540 PRINT

550 PRINT

560 COLOR 14,1

570 PRINT"

Contract Administration"

580 PRINT

590 COLOR 15,1

600 PRINT"

Contract administration contains many activities,"
including those associated with assuring the government"
gets what it is entitled to under the terms of a contract."
Quality assurance measures are a primary means of making "
this happen."

610 PRINT"

620 PRINT"

630 PRINT"

640 PRINT"

650 PRINT

660 PRINT"

Quality assurance in government procurement is achieved"
through both inspection and warranty provisions set forth"
in government contracts. Each of these provisions plays"
an important part in the quality process at specific points"
in the life cycle of the contract."

670 PRINT"

680 PRINT"

690 PRINT"

700 PRINT"

710 PRINT

720 PRINT"

730 PRINT"

740 PRINT"

750 PRINT"

Inspections are carried out prior to government"
acceptance of the good or service contracted. Warranties"
provide protection after acceptance. We'll discuss"
inspections first, and then warranties."

760 PRINT

770 PRINT

780 INPUT"

To continue, press (ENTER)",P

790 CLS

800 PRINT

810 PRINT

820 PRINT

830 PRINT

840 COLOR 14,1

850 PRINT"

Inspections"

860 PRINT

870 PRINT

880 COLOR 15,1

890 PRINT"

The primary guidance for inspection activities is the"
Federal Acquisition Regulation (FAR). In a large sense,"
inspections provide the government its earliest opportunity"
to evaluate a contractor's performance. As a result,"
inspections are considered the government's primary means"
of ensuring quality. The intensity of an inspection"
program depends on two things:"

900 PRINT"

910 PRINT"

920 PRINT"

930 PRINT"

940 PRINT"

950 PRINT"

960 PRINT

970 PRINT"

980 PRINT

990 PRINT"

1000 PRINT

1010 PRINT

1. the contractor involved in the procurement, and"

2. the nature of the procured item (complexity, etc.)"

1020 PRINT
1030 PRINT
1040 INPUT"
1050 CLS
1060 PRINT
1070 PRINT
1080 PRINT
1090 PRINT
1100 PRINT"
1110 PRINT"
1120 PRINT"
1130 PRINT"
1140 PRINT"
1150 PRINT"
1160 PRINT
1170 PRINT"
1180 PRINT"
1190 PRINT"
1200 PRINT
1210 PRINT"
1220 PRINT"
1230 PRINT
1240 PRINT
1250 PRINT
1260 PRINT
1270 PRINT
1280 INPUT"
1290 PRINT
1300 CLS
1310 PRINT
1320 PRINT
1330 PRINT
1340 PRINT
1350 PRINT
1360 PRINT
1370 PRINT"
1380 PRINT"
1390 PRINT"
1400 PRINT
1410 PRINT"
1420 PRINT"
1430 PRINT
1440 PRINT"
1450 PRINT
1460 PRINT"
1470 PRINT"
1480 PRINT
1490 PRINT
1500 PRINT
1510 PRINT
1520 PRINT
1530 INPUT"

To continue, press <ENTER>","P

Although the government retains the right to determine" the nature of its quality assurance programs, the FAR" stipulates that the government shall rely on the" contractor to perform all necessary inspections and tests." The exceptions to this rule, as deemed necessary by the" contracting officer, can occur at either of the following:"

1. any time the when government has a need to perform" such activities to check the contractor's internal" work processes, or"
2. in advance of accepting the contractor's offer of" the final product."

To continue, press <ENTER>","P

The FAR defines general inspection guidelines which" apply to all contract categories, as well as specific" guidelines for different contract types."

The general guidelines are discussed below, in two" categories:"

1. the government's rights, and"
2. requirements levied on the contractor by the" government."

To continue, press <ENTER>","P

```

1540 COLOR 11,1
1550 CLS
1560 PRINT
1570 COLOR 14,1
1580 PRINT"                                SELF-TEST QUESTION"
1590 COLOR 11,1
1600 PRINT
1610 PRINT
1620 PRINT"                                Before continuing, indicate your answer to the following."
1630 PRINT
1640 PRINT
1650 PRINT"                                Without exception, the FAR requires a contractor to"
1660 PRINT"                                perform all necessary inspection activities."
1670 PRINT
1680 PRINT"                                a. True"
1690 PRINT"                                b. False"
1700 PRINT
1710 PRINT
1720 INPUT"                                Select a or b, and press <ENTER> ",A$
1730 IF A$="A" THEN 1840
1740 IF A$="a" THEN 1840
1750 IF A$="B" THEN 1810
1760 IF A$="b" THEN 1810
1770 PRINT
1780 PRINT
1790 PRINT"                                ("A$") is not a choice. Try again."
1800 GOTO 1710
1810 PRINT
1820 PRINT"                                Correct. Let's continue."
1830 GOTO 1890
1840 PRINT
1850 PRINT"                                Incorrect. The correct answer is B. The FAR provides"
1860 PRINT"                                contracting officers with several exceptions"
1870 PRINT"                                to the general guidance that a contractor"
1880 PRINT"                                perform all inspections and tests."
1890 PRINT
1900 INPUT"                                To continue, press <ENTER> ",P
1910 COLOR 14,1
1920 CLS
1930 PRINT
1940 PRINT
1950 PRINT
1960 PRINT
1970 PRINT"                                Government Inspection"
1980 COLOR 15,1
1990 PRINT
2000 PRINT
2010 PRINT"                                The FAR requires the contractor to provide and"
2020 PRINT"                                maintain an inspection system acceptable to the government."
2030 PRINT"                                Additionally, the government retains the right to inspect"
2040 PRINT"                                and test the procured item/s called out in the contract to"
2050 PRINT"                                the extent practicable. However, this does not give the"

```

2060 PRINT" government free reign to do whatever it pleases. Three"
2070 PRINT" areas of concern to be considered as the government plans"
2080 PRINT" its inspection activities are time, place, and costs of"
2090 PRINT" inspection. Let's consider, separately, the ramifications"
2100 PRINT" of each."

2110 PRINT
2120 PRINT
2130 PRINT
2140 PRINT
2150 PRINT
2160 INPUT"

To continue, press <ENTER>","P

2170 CLS
2180 PRINT
2190 PRINT
2200 PRINT
2210 PRINT
2220 PRINT
2230 COLOR 14,1
2240 PRINT"
2250 COLOR 15,1
2260 PRINT
2270 PRINT

Time of Inspection"

2280 PRINT" While the FAR offers the government flexibility by"
2290 PRINT" suggesting it can inspect at all...times, including the"
2300 PRINT" period of manufacture, and in any event before acceptance,"
2310 PRINT" it also opens the door for potential liabilities. Such is"
2320 PRINT" the case if the contractor is caused undue or unreasonable"
2330 PRINT" delay. Fortunately, the courts do not deem all delays"
2340 PRINT" unreasonable; contractors must anticipate some"
2350 PRINT" inspection-related delays during the preparation of their"
2360 PRINT" contract proposals."

2370 PRINT
2380 PRINT
2390 PRINT
2400 PRINT
2410 PRINT
2420 INPUT"

To continue, press <ENTER>","P

2430 CLS
2440 PRINT
2450 PRINT
2460 PRINT
2470 PRINT
2480 PRINT
2490 PRINT"
2500 PRINT"
2510 PRINT"
2520 PRINT"
2530 PRINT"
2540 PRINT"
2550 PRINT"
2560 PRINT"
2570 PRINT"

Also, while the FAR indicates inspection will, in"
general, take place prior to government acceptance, a"
provision for Certificate of Conformance may be applied."
Such a certificate is offered by the contractor to the"
government (like a guarantee of quality) and can be used"
as the government's sole consideration for acceptance."
Certificate's of Conformance are usually only considered"
appropriate in those situations where either small losses"
would be incurred or the contractor's reputation and past"

2580 PRINT"
2590 PRINT"
2600 PRINT"
2610 PRINT
2620 PRINT
2630 PRINT
2640 PRINT
2650 PRINT
2660 INPUT"
2670 CLS
2680 PRINT
2690 PRINT
2700 PRINT
2710 COLOR 14,1
2720 PRINT"
2730 PRINT
2740 PRINT
2750 COLOR 15,1
2760 PRINT"
2770 PRINT"
2780 PRINT"
2790 PRINT"
2800 PRINT
2810 PRINT"
2820 PRINT"
2830 PRINT
2840 PRINT"
2850 PRINT"
2860 PRINT
2870 PRINT"
2880 PRINT"
2890 PRINT
2900 PRINT
2910 PRINT
2920 INPUT"
2930 CLS
2940 PRINT
2950 PRINT
2960 PRINT
2970 PRINT
2980 PRINT
2990 PRINT
3000 PRINT
3010 PRINT
3020 PRINT
3030 PRINT"
3040 PRINT"
3050 PRINT
3060 PRINT"
3070 PRINT"
3080 PRINT
3090 PRINT

performance warrant such an award. However, even if this"
certificate is used, the government still reserves the"
right to inspect."

To continue, press <ENTER>","P

Place of Inspection"

In general, the contract should indicate the location"
of inspections. The FAR offers five recommendations the"
government should consider when choosing a location. The"
location is suitable--"

- a. if use of any another place would cause"
uneconomical disassembly or destructive testing,"
- b. if considerable loss would result from making and"
shipping unacceptable products,"
- c. if special instruments, facilities, etc., are"
available only at the source,"

To continue, press <ENTER>","P

- d. if government inspection during contract"
performance is deemed essential, or"
- e. if, for any other reasons, it is seen as in the"
best interests of the government."

3100 PRINT
3110 PRINT
3120 PRINT
3130 PRINT
3140 PRINT
3150 PRINT
3160 INPUT"
3170 CLS
3180 COLOR 14,1
3190 PRINT
3200 PRINT
3210 PRINT
3220 PRINT
3230 PRINT
3240 PRINT
3250 PRINT"
3260 COLOR 15,1
3270 PRINT
3280 PRINT
3290 PRINT"
3300 PRINT"
3310 PRINT"
3320 PRINT"
3330 PRINT"
3340 PRINT"
3350 PRINT"
3360 PRINT
3370 PRINT
3380 PRINT
3390 PRINT
3400 PRINT
3410 PRINT
3420 INPUT"
3430 COLOR 11,1
3440 CLS
3450 PRINT
3460 COLOR 14,1
3470 PRINT"
3480 COLOR 11,1
3490 PRINT
3500 PRINT
3510 PRINT"
3520 PRINT
3530 PRINT
3540 PRINT"
3550 PRINT
3560 PRINT
3570 PRINT"
3580 PRINT"
3590 PRINT"
3600 PRINT
3610 PRINT

To continue, press <ENTER>","P

Costs of Inspection"

If inspection is performed at the contractor's or subcontractor's premises, the contractor will provide facilities and assistance without additional charge. If inspection is conducted at other than contractor premises, the government bears the expense. The same applies if the government requires special inspection equipment, regardless of where the inspection occurs."

To continue, press <ENTER>","P

SELF-TEST QUESTION"

Complete the following statement."

A Certificate of Conformance is submitted by:"

- a. the contracting officer."
- b. the contractor."
- c. either a or b, depending upon the circumstance."

```

3620 INPUT"      Select a, b, or c, and press <ENTER> ",A$
3630 IF A$="A" THEN 3760
3640 IF A$="a" THEN 3760
3650 IF A$="B" THEN 3730
3660 IF A$="b" THEN 3730
3670 IF A$="C" THEN 3760
3680 IF A$="c" THEN 3760
3690 PRINT
3700 PRINT
3710 PRINT"      ("A$") is not a choice. Try again."
3720 GOTO 3610
3730 PRINT
3740 PRINT"      Correct. Let's continue."
3750 GOTO 3800
3760 PRINT
3770 PRINT"      Incorrect. The correct answer is B. The contractor"
3780 PRINT"      submits a Certificate of Conformance for the"
3790 PRINT"      government's consideration."
3800 PRINT
3810 INPUT"                                     To continue, press <ENTER> ",P
3820 COLOR 14,1
3830 CLS
3840 PRINT
3850 PRINT"                                     Contractor Responsibility"
3860 PRINT
3870 PRINT
3880 COLOR 15,1
3890 PRINT"      In addition to establishing government inspection"
3900 PRINT"      rights, the FAR requires contractors to provide and"
3910 PRINT"      maintain an inspection system acceptable to the"
3920 PRINT"      government. It further requires contractors to:"
3930 PRINT
3940 PRINT"      1. control the quality of their supplies and services,"
3950 PRINT
3960 PRINT"      2. tender for acceptance only supplies and services"
3970 PRINT"      which conform to contract requirements,"
3980 PRINT
3990 PRINT"      3. ensure vendors have adequate quality control, and"
4000 PRINT
4010 PRINT"      4. maintain records of inspection activities which"
4020 PRINT"      evidence the fact that supplies and services"
4030 PRINT"      conform to the contract, and furnish the"
4040 PRINT"      government such information as required."
4050 PRINT
4060 INPUT"                                     To continue, press <ENTER> ",P
4070 COLOR 11,1
4080 CLS
4090 PRINT
4100 COLOR 14,1
4110 PRINT"                                     SELF-TEST QUESTION"
4120 COLOR 11,1
4130 PRINT

```

```

4140 PRINT
4150 PRINT"      Indicate your answer to the following."
4160 PRINT
4170 PRINT
4180 PRINT"      The FAR specifies that a contractor must only submit"
4190 PRINT"      products which conform to contract requirements."
4200 PRINT
4210 PRINT"          a. True"
4220 PRINT"          b. False"
4230 PRINT
4240 PRINT
4250 INPUT"      Select a or b, and press <ENTER> ",A$
4260 IF A$="A" THEN 4340
4270 IF A$="a" THEN 4340
4280 IF A$="B" THEN 4370
4290 IF A$="b" THEN 4370
4300 PRINT
4310 PRINT
4320 PRINT"      ("A$") is not a choice. Try again."
4330 GOTO 4240
4340 PRINT
4350 PRINT"      Correct. Let's continue."
4360 GOTO 4410
4370 PRINT
4380 PRINT"      Incorrect. The correct answer is A. The FAR mandates"
4390 PRINT"      that a contractor only submit products which"
4400 PRINT"      conform to the requirements of the contract."
4410 PRINT
4420 INPUT"      To continue, press <ENTER> ",P
4430 COLOR 15,1
4440 CLS
4450 PRINT
4460 PRINT
4470 PRINT
4480 PRINT
4490 PRINT
4500 PRINT
4510 PRINT
4520 PRINT
4530 PRINT"      Should a contractor's system of inspection fail to"
4540 PRINT"      screen out defective items or practices, the courts have"
4550 PRINT"      ruled that the government has the right to decline further"
4560 PRINT"      inspections. However, government actions to reject the"
4570 PRINT"      contractor's performance must follow specific guidelines."
4580 PRINT
4590 PRINT
4600 PRINT
4610 PRINT
4620 PRINT
4630 PRINT
4640 PRINT
4650 PRINT

```


4660 PRINT
4670 INPUT"
4680 CLS
4690 COLOR 14,1
4700 PRINT
4710 PRINT
4720 PRINT
4730 PRINT
4740 PRINT
4750 PRINT
4760 PRINT"
4770 COLOR 15,1
4780 PRINT
4790 PRINT
4800 PRINT"
4810 PRINT"
4820 PRINT"
4830 PRINT"
4840 PRINT
4850 PRINT"
4860 PRINT"
4870 PRINT"
4880 PRINT
4890 PRINT
4900 PRINT
4910 PRINT
4920 PRINT
4930 INPUT"
4940 CLS
4950 PRINT
4960 PRINT
4970 PRINT
4980 PRINT
4990 PRINT
5000 PRINT"
5010 PRINT
5020 PRINT"
5030 PRINT"
5040 PRINT"
5050 PRINT"
5060 PRINT"
5070 PRINT"
5080 PRINT"
5090 PRINT"
5100 PRINT"
5110 PRINT"
5120 PRINT
5130 PRINT
5140 PRINT
5150 PRINT
5160 PRINT
5170 INPUT"

To continue, press <ENTER>","P

Rejection and Correction"

A contractor's work may be rejected if it does not" comply with the government's specifications. There are six" key points about rejecting supplies and services which" apply to government contracts;"

1. Nonconformance most often results in rejection when" performance, durability, operational effectiveness," appearance, or weight have been adversely affected."

To continue, press <ENTER>","P

2. The contractor must be given timely notice."

Obviously this can mean a lot of things, but" the bottom line is that as soon as the government" knows it intends to reject, it should inform the" contractor. Otherwise, an implied acceptance on" the part of the government can result. Consider" the case where the government implicitly accepted" almost 36,000 eggs because it retained them for" more than two months after inspection had been" performed without communication of a rejection to" the contractor."

To continue, press <ENTER>","P

5180 CLS
5190 PRINT
5200 PRINT*
5210 PRINT*
5220 PRINT*
5230 PRINT*
5240 PRINT*
5250 PRINT*
5260 PRINT*
5270 PRINT
5280 PRINT*
5290 PRINT*
5300 PRINT*
5310 PRINT*
5320 PRINT*
5330 PRINT*
5340 PRINT*
5350 PRINT*
5360 PRINT*
5370 PRINT*
5380 PRINT*
5390 PRINT
5400 PRINT
5410 INPUT*
5420 CLS
5430 PRINT
5440 PRINT
5450 PRINT
5460 PRINT*
5470 PRINT*
5480 PRINT*
5490 PRINT*
5500 PRINT*
5510 PRINT*
5520 PRINT*
5530 PRINT*
5540 PRINT*
5550 PRINT*
5560 PRINT*
5570 PRINT
5580 PRINT*
5590 PRINT*
5600 PRINT*
5610 PRINT*
5620 PRINT
5630 PRINT
5640 PRINT
5650 INPUT*
5660 COLOR 11,1
5670 CLS
5680 PRINT
5690 COLOR 14,1

3. The FAR requires the government to include reasons" for its rejection when it notifies the contractor." The government's notification need not be in" writing unless the rejection is communicated at a" place other than the contractor's facilities, or if" the contractor continues to submit nonconforming" supplies or services."

4. Two options are available to the government in the" event the contractor's product is found to be" defective. First, if the defects appear to be repairable within the normal contract period, the" government must allow the contractor the" opportunity to make such corrections. In addition," if a defect is relatively minor and the contractor" delivered ahead of schedule believing the product" would be accepted, it must be given a reasonable" amount of time past the delivery date to make corrections."

To continue, press <ENTER>*,P

5. If final inspection is performed (per the contract)" at a government facility, government rejection" would require the contractor to remove the" defective product unless authorized to complete" corrections-in-place. If rejected items are not" removed promptly the government can terminate the" contract (unlikely in most situations) or remove," replace, or repair the item at the contractor's" expense. However, termination only applies if the" defects are judged not repairable within the" delivery schedule specified by the contract."

6. Should the government decide to accept defective" goods or services (which it can do in its own best" interest), it can require an equitable price" reduction from the contractor."

To continue, press <ENTER>*,P

```

5700 PRINT"
5710 COLOR 11,1
5720 PRINT
5730 PRINT
5740 PRINT"      Indicate your answer to the following."
5750 PRINT
5760 PRINT
5770 PRINT"      A contractor can be authorized time beyond the delivery"
5780 PRINT"      date to make corrections to a product."
5790 PRINT
5800 PRINT"          a. True"
5810 PRINT"          b. False"
5820 PRINT
5830 PRINT
5840 INPUT"      Select a or b, and press <ENTER> ",A$
5850 IF A$="A" THEN 5930
5860 IF A$="a" THEN 5930
5870 IF A$="B" THEN 5960
5880 IF A$="b" THEN 5960
5890 PRINT
5900 PRINT
5910 PRINT"      ("A$") is not a choice. Try again."
5920 GOTO 5830
5930 PRINT
5940 PRINT"      Correct. Let's continue."
5950 GOTO 6030
5960 PRINT
5970 PRINT"      Incorrect. The correct answer is A. If the contractor"
5980 PRINT"      delivers ahead of schedule and reasonably"
5990 PRINT"      believes the product will be accepted, yet"
6000 PRINT"      minor defects are found, it must be authorized"
6010 PRINT"      time beyond the contract date to make"
6020 PRINT"      corrections."
6030 PRINT
6040 INPUT"      To continue, press <ENTER> ",P
6050 COLOR 15,1
6060 CLS
6070 PRINT
6080 PRINT
6090 PRINT
6100 PRINT
6110 PRINT
6120 PRINT
6130 PRINT
6140 PRINT
6150 PRINT
6160 PRINT"      Now let's assume the government and contractor"
6170 PRINT"      are progressing with a satisfactory inspection program,"
6180 PRINT"      and both sides are ready for final inspection and"
6190 PRINT"      acceptance under terms of the contract."
6200 PRINT
6210 PRINT

```

6220 PRINT
6230 PRINT
6240 PRINT
6250 PRINT
6260 PRINT
6270 PRINT
6280 PRINT
6290 INPUT*

To continue, press <ENTER>*,P

6300 CLS
6310 COLOR 14,1
6320 PRINT
6330 PRINT
6340 PRINT
6350 PRINT
6360 PRINT
6370 PRINT*
6380 COLOR 15,1
6390 PRINT
6400 PRINT

Acceptance*

6410 PRINT*
6420 PRINT*
6430 PRINT*
6440 PRINT*
6450 PRINT*
6460 PRINT*
6470 PRINT*
6480 PRINT*
6490 PRINT*
6500 PRINT
6510 PRINT
6520 PRINT
6530 PRINT
6540 PRINT
6550 INPUT*

In general, government acceptance can occur before,*
at the time of, or even after delivery of the product.*
Inspecting for the purpose of acceptance is a critical*
activity for the government. The implications of*
inspecting for acceptance at other than the point of final*
destination could terminate the contractor's liability*
before the government gets final assurance of the fit and*
performance of the product. There are two guidelines*
which establish the policy for government acceptance.*

To continue, press <ENTER>*,P

6560 CLS
6570 PRINT
6580 PRINT
6590 PRINT
6600 PRINT
6610 PRINT
6620 PRINT
6630 PRINT
6640 PRINT*
6650 PRINT*
6660 PRINT*
6670 PRINT*
6680 PRINT*
6690 PRINT*
6700 PRINT*
6710 PRINT*
6720 PRINT
6730 PRINT

1. Implied acceptance is binding on the government,*
and most frequently occurs as a result of the*
government's use or retention of a contractor's*
product, thereby interfering with the contractor's*
ownership of that product. For example, a court*
ruled that one government agency gave an implied*
acceptance when it used a boiler for over eighty*
days without ever formally accepting that item.*

6740 PRINT
 6750 PRINT
 6760 PRINT
 6770 PRINT
 6780 PRINT
 6790 INPUT"
 6800 CLS
 6810 PRINT
 6820 PRINT
 6830 PRINT
 6840 PRINT
 6850 PRINT"
 6860 PRINT"
 6870 PRINT"
 6880 PRINT"
 6890 PRINT
 6900 PRINT"
 6910 PRINT
 6920 PRINT"
 6930 PRINT
 6940 PRINT"
 6950 PRINT
 6960 PRINT"
 6970 PRINT"
 6980 PRINT
 6990 PRINT
 7000 PRINT
 7010 PRINT
 7020 PRINT
 7030 INPUT"
 7040 COLOR 11,1
 7050 CLS
 7060 PRINT
 7070 COLOR 14,1
 7080 PRINT"
 7090 COLOR 11,1
 7100 PRINT
 7110 PRINT
 7120 PRINT"
 7130 PRINT
 7140 PRINT
 7150 PRINT"
 7160 PRINT"
 7170 PRINT"
 7180 PRINT
 7190 PRINT"
 7200 PRINT"
 7210 PRINT
 7220 PRINT
 7230 INPUT"
 7240 IF A\$="A" THEN 7320
 7250 IF A\$="a" THEN 7320

To continue, press <ENTER> ",P

2. The FAR provides that in the absence of at least" one of four recognized exceptions, acceptance is" conclusive. The four exceptions to conclusiveness" are:"

- a. whenever latent defects are found,"
- b. whenever fraud is involved,"
- c. whenever gross mistakes amount to fraud, or"
- d. whenever warranties are included in the" contract."

To continue, press <ENTER> ",P

SELF-TEST QUESTION"

Indicate your answer to the following."

Interfering with the contractor's ownership of its product" can be seen as an implied acceptance of that product" by the government."

- a. True"
- b. False"

Select a or b, and press <ENTER> ",A\$

```

7260 IF A$="B" THEN 7350
7270 IF A$="b" THEN 7350
7280 PRINT
7290 PRINT
7300 PRINT      ("A$") is not a choice. Try again."
7310 GOTO 7220
7320 PRINT
7330 PRINT      Correct. Let's continue."
7340 GOTO 7410
7350 PRINT
7360 PRINT      Incorrect. The correct answer is A. Courts of law have"
7370 PRINT      ruled that government interference with a"
7380 PRINT      contractor's ownership of (ability to control)"
7390 PRINT      a product can constitute an implied acceptance"
7400 PRINT      of that product."
7410 PRINT
7420 INPUT      To continue, press <ENTER>".P
7430 COLOR 15,1
7440 CLS
7450 PRINT
7460 PRINT
7470 PRINT
7480 PRINT
7490 PRINT
7500 PRINT
7510 PRINT
7520 PRINT
7530 PRINT
7540 PRINT      Let's return to the four exceptions to conclusiveness,"
7550 PRINT      latent defects, fraud, gross mistakes which amount to"
7560 PRINT      fraud, and warranties, and consider each separately."
7570 PRINT
7580 PRINT
7590 PRINT
7600 PRINT
7610 PRINT
7620 PRINT
7630 PRINT
7640 PRINT
7650 PRINT
7660 PRINT
7670 INPUT      To continue, press <ENTER>".P
7680 CLS
7690 PRINT
7700 PRINT
7710 PRINT
7720 PRINT
7730 PRINT      A latent defect is one which is hidden from knowledge"
7740 PRINT      and sight, and could not be found through reasonable"
7750 PRINT      inspection or care. A more frequent occurrence is a patent"
7760 PRINT      defect, which also remains hidden, but should have been"
7770 PRINT      found through inspection activities. For example, lack of"

```

7780 PRINT"
7790 PRINT"
7800 PRINT"
7810 PRINT"
7820 PRINT"
7830 PRINT"
7840 PRINT"
7850 PRINT"
7860 PRINT
7870 PRINT
7880 PRINT
7890 PRINT
7900 PRINT
7910 INPUT"
7920 CLS
7930 PRINT
7940 PRINT
7950 PRINT
7960 PRINT
7970 PRINT
7980 PRINT
7990 PRINT"
8000 PRINT"
8010 PRINT"
8020 PRINT"
8030 PRINT"
8040 PRINT"
8050 PRINT"
8060 PRINT"
8070 PRINT"
8080 PRINT
8090 PRINT
8100 PRINT
8110 PRINT
8120 PRINT
8130 PRINT
8140 PRINT
8150 INPUT"
8160 CLS
8170 PRINT
8180 PRINT
8190 PRINT
8200 PRINT
8210 PRINT
8220 PRINT
8230 PRINT
8240 PRINT"
8250 PRINT"
8260 PRINT"
8270 PRINT"
8280 PRINT"
8290 PRINT"

a specified hardness for a grinding wheel was not found to
be latent since a test would have uncovered the deficiency."
On the other hand, a case where 16 of almost 12,000 bolts"
were found to be undersized was ruled as latent in that a"
reasonable sample inspection would not likely have"
uncovered those defects. At any rate, the burden of proof"
for latency rests with the government, and experience has"
shown this to be a substantial burden indeed."

To continue, press <ENTER>".P

In cases of fraud, the government is once again faced"
with substantial burden of proof that its acceptance was"
induced by a deliberate misrepresentation of the facts"
with an intent to mislead, resulting in damages to the"
government. More often than not, when the government has"
evidence to support allegations of fraud, it tends to"
prosecute under statutes calling for civil and criminal"
penalties against the contractor. If successful, the"
government receives double damages."

To continue, press <ENTER>".P

Gross mistakes also result in overturning government"
acceptance. Though such instances have the appearance of"
fraud and produce similar results, the key distinction is"
that gross mistakes are not intentional acts. An example"
of such a case is one where a contractor incorrectly"
certified that particular contract items were identical to"

8300 PRINT
8310 PRINT
8320 PRINT
8330 PRINT
8340 PRINT
8350 PRINT
8360 PRINT
8370 PRINT
8380 PRINT
8390 INPUT
8400 CLS
8410 PRINT
8420 PRINT
8430 PRINT
8440 PRINT
8450 PRINT
8460 PRINT
8470 PRINT
8480 PRINT
8490 PRINT
8500 PRINT
8510 PRINT
8520 PRINT
8530 PRINT
8540 PRINT
8550 PRINT
8560 PRINT
8570 PRINT
8580 PRINT
8590 PRINT
8600 PRINT
8610 INPUT
8620 COLOR 11,1
8630 CLS
8640 PRINT
8650 COLOR 14,1
8660 PRINT
8670 COLOR 11,1
8680 PRINT
8690 PRINT
8700 PRINT
8710 PRINT
8720 PRINT
8730 PRINT
8740 PRINT
8750 PRINT
8760 PRINT
8770 PRINT
8780 PRINT
8790 PRINT
8800 PRINT
8810 PRINT

ones previously tested and approved by the government."

To continue, press <ENTER>*,P

The last of the four exceptions to government acceptance involves warranties. Warranties, as we are about to investigate in detail, extend the contractor's liability for its product past the time of acceptance by the government. The government pays the contractor for such an extension as specified by a contract and therefore, should a defect arise after acceptance, the contractor has the responsibility to correct the deficiency."

To continue, press <ENTER>*,P

SELF-TEST QUESTION*

Complete the following statement."

The burden of proof for latency, fraud, and gross mistakes:"

- a. rests on the contractor."
- b. rests on the government."
- c. is the responsibility of a civil court of law."


```

8820 INPUT"      Select a, b, or c, and press <ENTER> ",A$
8830 IF A$="A" THEN 8960
8840 IF A$="a" THEN 8960
8850 IF A$="B" THEN 8930
8860 IF A$="b" THEN 8930
8870 IF A$="C" THEN 8960
8880 IF A$="c" THEN 8960
8890 PRINT
8900 PRINT
8910 PRINT"      ("A$") is not a choice. Try again."
8920 GOTO 8810
8930 PRINT
8940 PRINT"      Correct. Let's continue."
8950 GOTO 9000
8960 PRINT
8970 PRINT"      Incorrect. The correct answer is B. The burden of proof"
8980 PRINT"      in any of these three instances rests with"
8990 PRINT"      the government."
9000 PRINT
9010 INPUT"                                     To continue, press <ENTER> ",P
9020 COLOR 14,1
9030 CLS
9040 PRINT
9050 PRINT
9060 PRINT
9070 PRINT
9080 PRINT
9090 PRINT
9100 PRINT"                                     Warranties"
9110 COLOR 15,1
9120 PRINT
9130 PRINT
9140 PRINT"      The FAR defines a warranty as a promise or affirmation"
9150 PRINT"      given by a contractor to the government regarding the"
9160 PRINT"      nature, usefulness, or conditions of the supplies or"
9170 PRINT"      performance of services furnished under a contract. There"
9180 PRINT"      are two types of warranties which are applicable to"
9190 PRINT"      government contracting: express and implied. Let's take"
9200 PRINT"      a look at each of these separately."
9210 PRINT
9220 PRINT
9230 PRINT
9240 PRINT
9250 PRINT
9260 PRINT
9270 INPUT"                                     To continue, press <ENTER> ",P
9280 CLS
9290 PRINT
9300 PRINT
9310 COLOR 14,1
9320 PRINT"                                     Express Warranties"
9330 PRINT

```

9340 PRINT
 9350 COLOR 15,1
 9360 PRINT"
 9370 PRINT"
 9380 PRINT"
 9390 PRINT"
 9400 PRINT"
 9410 PRINT"
 9420 PRINT"
 9430 PRINT"
 9440 PRINT"
 9450 PRINT"
 9460 PRINT"
 9470 PRINT
 9480 PRINT"
 9490 PRINT"
 9500 PRINT"
 9510 PRINT
 9520 PRINT
 9530 INPUT"
 9540 CLS
 9550 PRINT
 9560 PRINT
 9570 PRINT
 9580 PRINT
 9590 PRINT
 9600 PRINT
 9610 PRINT"
 9620 PRINT"
 9630 PRINT
 9640 PRINT"
 9650 PRINT"
 9660 PRINT
 9670 PRINT"
 9680 PRINT"
 9690 PRINT
 9700 PRINT"
 9710 PRINT"
 9720 PRINT
 9730 PRINT
 9740 PRINT
 9750 PRINT
 9760 PRINT
 9770 INPUT"
 9780 COLOR 11,1
 9790 CLS
 9800 PRINT
 9810 COLOR 14,1
 9820 PRINT"
 9830 COLOR 11,1
 9840 PRINT
 9850 PRINT

Express warranties are ones which physically appear in a contractual agreement. Recent changes in acquisition policy require these warranties be included where weapon system production costs exceed \$100,000 per item or \$10 million for the total system. Though it may seem that the government might always include such warranties in its contracts, the government tends to exercise caution. If express warranties are used, their duration must be clearly spelled out in the contract. The FAR sets forth five factors which the government must consider before including express warranty provisions in a contract:

1. The nature and use of the supplies or services it wishes to procure (factors such as complexity and the potential for hidden defects apply here),

To continue, press <ENTER>,"P

2. The dollar costs associated with the contractor agreeing to extra liability,
3. Whether the government has the resources to administer and enforce a warranty,
4. Whether or not the contracted item is normally warranted in the trade, and
5. The potential for reducing government inspection in light of a warranty.

To continue, press <ENTER>,"P

SELF-TEST QUESTION

```

9860 PRINT"          Indicate your answer to the following."
9870 PRINT
9880 PRINT
9890 PRINT"          The decision to include an express warranty in a contract,"
9900 PRINT"          according to the FAR, need not include consideration of"
9910 PRINT"          the government's cost of enforcing the warranty."
9920 PRINT
9930 PRINT"          a. True"
9940 PRINT"          b. False"
9950 PRINT
9960 PRINT
9970 INPUT"          Select a or b, and press <ENTER> ",A$
9980 IF A$="A" THEN 10090
9990 IF A$="a" THEN 10090
10000 IF A$="B" THEN 10060
10010 IF A$="b" THEN 10060
10020 PRINT
10030 PRINT
10040 PRINT"          ("A$") is not a choice. Try again."
10050 GOTO 9960
10060 PRINT
10070 PRINT"          Correct. Let's continue."
10080 GOTO 10140
10090 PRINT
10100 PRINT"          Incorrect. The correct answer is B. Warranty enforcement"
10110 PRINT"          costs are among many factors the government"
10120 PRINT"          must consider before expressly requiring a"
10130 PRINT"          warranty in a contract."
10140 PRINT
10150 INPUT"                                     To continue, press <ENTER> ",P
10160 COLOR 14,1
10170 CLS
10180 PRINT
10190 PRINT
10200 PRINT
10210 PRINT"          Implied Warranties"
10220 COLOR 15,1
10230 PRINT
10240 PRINT
10250 PRINT"          Implied warranties do not physically appear in the"
10260 PRINT"          contract but are recognized by law as protection to the"
10270 PRINT"          buyer for the useful nature of a purchased good."
10280 PRINT
10290 PRINT"          To illustrate, consider an appliance purchase for a"
10300 PRINT"          television or toaster. Most warranties which accompany"
10310 PRINT"          such products include a statement indicating the purchaser"
10320 PRINT"          may have additional rights depending on the state in which"
10330 PRINT"          that buyer lives. Such statements indicate the existence"
10340 PRINT"          of implied warranties to protect consumers. These"
10350 PRINT"          warranties may even extend the manufacturer's liability"
10360 PRINT"          past the period explicitly stated in the warranty clause"
10370 PRINT"          itself."

```

10380 PRINT
10390 PRINT
10400 PRINT
10410 INPUT"
10420 CLS
10430 PRINT
10440 PRINT
10450 PRINT
10460 PRINT
10470 PRINT
10480 PRINT
10490 PRINT
10500 PRINT
10510 PRINT"
10520 PRINT"
10530 PRINT"
10540 PRINT"
10550 PRINT"
10560 PRINT"
10570 PRINT
10580 PRINT
10590 PRINT
10600 PRINT
10610 PRINT
10620 PRINT
10630 PRINT
10640 PRINT
10650 INPUT"
10660 CLS
10670 PRINT
10680 PRINT
10690 PRINT
10700 PRINT
10710 PRINT
10720 PRINT
10730 PRINT"
10740 PRINT"
10750 PRINT
10760 PRINT"
10770 PRINT"
10780 PRINT"
10790 PRINT"
10800 PRINT"
10810 PRINT"
10820 PRINT
10830 PRINT
10840 PRINT
10850 PRINT
10860 PRINT
10870 PRINT
10880 PRINT
10890 INPUT"

To continue, press <ENTER>","P

Further, under government contracts, the Uniform
Commercial Code (UCC) states implied warranties are"
applicable unless specifically excluded by language written"
into the contract. On numerous occasions, Boards of"
Contract Appeals have relied on UCC principles of implied"
warranties in resolving government contract disputes."

To continue, press <ENTER>","P

There are two types of implied warranties which"
require further illustration."

The first type of implied warranty, merchantability,"
refers to the requirement that goods are appropriate for"
the purpose for which they are normally sold. An example"
might be for a bucket's implied ability to hold water."
Should the government desire to waive this type of"
warranty, it may do so either orally or in writing."

To continue, press <ENTER>","P

```

10900 CLS
10910 PRINT
10920 PRINT
10930 PRINT
10940 PRINT
10950 PRINT
10960 PRINT
10970 PRINT"
10980 PRINT"
10990 PRINT"
11000 PRINT"
11010 PRINT"
11020 PRINT"
11030 PRINT"
11040 PRINT"
11050 PRINT"
11060 PRINT"
11070 PRINT
11080 PRINT
11090 PRINT
11100 PRINT
11110 PRINT
11120 PRINT
11130 INPUT"
11140 COLOR 11,1
11150 CLS
11160 PRINT
11170 COLOR 14,1
11180 PRINT"
11190 COLOR 11,1
11200 PRINT
11210 PRINT
11220 PRINT"
11230 PRINT
11240 PRINT
11250 PRINT"
11260 PRINT
11270 PRINT
11280 PRINT"
11290 PRINT"
11300 PRINT"
11310 PRINT"
11320 PRINT
11330 PRINT
11340 INPUT"
11350 IF A$="A" THEN 11480
11360 IF A$="a" THEN 11480
11370 IF A$="B" THEN 11480
11380 IF A$="b" THEN 11480
11390 IF A$="C" THEN 11450
11400 IF A$="c" THEN 11450
11410 PRINT

```

The second type, fitness for a particular purpose, can" only be waived in writing. Warranties for fitness suggest" a buyer who is relying on the judgment of the seller to" select suitable goods. That is, goods will in fact be fit" for the buyer's purpose. For example, a salesman might" tell a customer that a particular solvent will remove oil" stains on a driveway. Should the solvent, which is" normally used for other applications, not perform as the" salesman promised, the customer has grounds for getting" his or her money back from the sale."

To continue, press <ENTER> ",P

SELF-TEST QUESTION"

Complete the following statement."

According to the UCC, implied warranties are applicable:"

- a. unless waived by the contracting officer."
- b. unless a Certificate of Conformance is submitted" by the contractor."
- c. unless excluded by written notice in the contract."

Select a, b, or c, and press <ENTER> ",A\$

11420 PRINT
 11430 PRINT" ("A6") is not a choice. Try again."
 11440 GOTO 11330
 11450 PRINT
 11460 PRINT" Correct. Let's continue."
 11470 GOTO 11520
 11480 PRINT
 11490 PRINT" Incorrect. The correct answer is C. Implied warranties"
 11500 PRINT" are applicable unless specifically excluded"
 11510 PRINT" in the written contract."
 11520 PRINT
 11530 INPUT" To continue, press <ENTER>".P
 11540 COLOR 14,1
 11550 CLS
 11560 PRINT
 11570 PRINT" Warranty Breaches"
 11580 COLOR 15,1
 11590 PRINT
 11600 PRINT
 11610 PRINT" Options available to an individual who is the victim of"
 11620 PRINT" a warranty breach (default) are somewhat similar to those"
 11630 PRINT" the government might take against a contractor. Should a"
 11640 PRINT" breach occur, the government contracting officer has"
 11650 PRINT" two options:"
 11660 PRINT
 11670 PRINT" 1. the contractor may be required to correct or"
 11680 PRINT" replace nonconforming supplies (or parts), or"
 11690 PRINT
 11700 PRINT" 2. the government may retain the nonconformables and"
 11710 PRINT" require the contractor to make an equitable"
 11720 PRINT" adjustment in price."
 11730 PRINT
 11740 PRINT" In either case, the FAR stipulates that the"
 11750 PRINT" contractor's obligation to repair, replace, or adjust"
 11760 PRINT" price will include appropriate labor and material costs."
 11770 PRINT
 11780 PRINT
 11790 INPUT" To continue, press <ENTER>".P
 11800 CLS
 11810 PRINT
 11820 PRINT
 11830 PRINT
 11840 COLOR 14,1
 11850 PRINT" Concluding Remarks"
 11860 PRINT
 11870 COLOR 15,1
 11880 PRINT" Given the conclusiveness of acceptance and the"
 11890 PRINT" difficulties the government can have in proving claims"
 11900 PRINT" against a contractor, it is easy to see why the government"
 11910 PRINT" places such high priority on inspection programs. Further,"
 11920 PRINT" the government's reliance on inspections as the primary"
 11930 PRINT" means of ensuring product quality has minimized the role"

```

11940 PRINT"      of warranties for many acquisitions. However, when system"
11950 PRINT"      complexity or other factors suggest appreciable risk, the"
11960 PRINT"      government turns to warranties for continued assurance of"
11970 PRINT"      product quality after acceptance. These two critical"
11980 PRINT"      mechanisms, inspection and warranty, are the government's"
11990 PRINT"      tools for ensuring it receives what it bargains for when"
12000 PRINT"      it makes purchases under contractual agreements."
12010 PRINT
12020 PRINT
12030 PRINT
12040 PRINT
12050 INPUT"
12060 COLOR 11,1
12070 CLS
12080 PRINT
12090 COLOR 14,1
12100 PRINT"      SELF-TEST QUESTION"
12110 COLOR 11,1
12120 PRINT
12130 PRINT
12140 PRINT"      Indicate your answer to the following."
12150 PRINT
12160 PRINT
12170 PRINT"      If a product has a defect and the contractor breaches the"
12180 PRINT"      warranty agreement covering the product, the government may"
12190 PRINT"      require the contractor to adjust the product's price."
12200 PRINT
12210 PRINT
12220 PRINT"      a. True"
12230 PRINT"      b. False"
12240 PRINT
12250 PRINT
12260 INPUT"      Select a or b, and press <ENTER> ",A$
12270 IF A$="A" THEN 12350
12280 IF A$="a" THEN 12350
12290 IF A$="B" THEN 12380
12300 IF A$="b" THEN 12380
12310 PRINT
12320 PRINT
12330 PRINT"      ("A$") is not a choice. Try again."
12340 GOTO 12250
12350 PRINT
12360 PRINT"      Correct. Let's continue."
12370 GOTO 12430
12380 PRINT
12390 PRINT"      Incorrect. The correct answer is A. The government may"
12400 PRINT"      require a contractor to make an equitable"
12410 PRINT"      adjustment in price should the contractor"
12420 PRINT"      breach a warranty."
12430 PRINT
12440 INPUT"
12450 CLS

```

To continue, press <ENTER>^,P

SELF-TEST QUESTION

Indicate your answer to the following."

If a product has a defect and the contractor breaches the warranty agreement covering the product, the government may require the contractor to adjust the product's price."

a. True"

b. False"

Select a or b, and press <ENTER> ^,A\$

("A\$") is not a choice. Try again."

Correct. Let's continue."

Incorrect. The correct answer is A. The government may require a contractor to make an equitable adjustment in price should the contractor breach a warranty."

To continue, press <ENTER>^,P

12460 COLOR 14,1

12470 PRINT

12480 PRINT"

END OF LESSON"

12490 PRINT

12500 PRINT

12510 COLOR 15,1

12520 PRINT"

You have completed the computerized text portion of"
this exercise. Before proceeding to the quiz, please do"
the following:"

12530 PRINT"

12540 PRINT"

12550 PRINT

12560 PRINT"

1. Open the quiz envelope and remove the quiz."

12570 PRINT

12580 PRINT"

2. Write the elapsed time shown on the blackboard on"
the cover of your quiz."

12590 PRINT"

12600 PRINT

12610 PRINT"

3. On the computer keyboard, type the word SYSTEM"
and press the <ENTER> key."

12620 PRINT"

12630 PRINT

12640 PRINT"

4. Turn off your monitor by depressing the ON/OFF"
button at the front of your color monitor."

12650 PRINT"

12660 PRINT

12670 PRINT"

5. Open the quiz and answer the questions."

12680 PRINT

12690 PRINT

12700 END

Appendix B: Bottom-up Structured Lesson

```
10 REM THIS IS THE BOTTOM-UP STRUCTURED PROGRAM
20 KEY OFF
30 COLOR 14,1
40 CLS
50 PRINT
60 PRINT"                                INTRODUCTION"
70 PRINT
80 PRINT
90 COLOR 15,1
100 PRINT" Welcome to this presentation on government contracting."
110 PRINT" The material you are about to review is based on subject"
120 PRINT" matter extracted from the Federal Acquisition Regulation"
130 PRINT" (FAR) and AFIT course CMGT 523, Contracting and Acquisition"
140 PRINT" Management. This material was chosen not only for its"
150 PRINT" interest to AF managers but for its relevance to your"
160 PRINT" career field in particular. There are three parts to"
170 PRINT" this presentation:"
180 PRINT
190 PRINT"      1. The text portion using computer-assisted"
200 PRINT" instruction (following these introductions),"
210 PRINT
220 PRINT"      2. A written quiz (in the envelope beside your"
230 PRINT" computer) over the learning material in step 1,"
240 PRINT
250 PRINT"      3. A brief survey, following the written quiz, to"
260 PRINT" ask for your feedback on this presentation."
270 PRINT
280 INPUT"                                To continue, press <ENTER>","P
290 CLS
300 PRINT
310 PRINT
320 PRINT
330 PRINT
340 PRINT" The computer program itself is written like a text, but"
350 PRINT" with a SELF-TEST QUESTION occasionally inserted to help"
360 PRINT" you reinforce main points. These questions, displayed"
370 PRINT" with the same blue background you see here but with light"
380 PRINT" blue text writing, will also give you a good idea of what"
390 PRINT" to expect from the short quiz you will complete at the"
400 PRINT" conclusion of this computer portion of the exercise."
410 PRINT
420 PRINT" Your participation in this review is greatly appreciated."
430 PRINT" Though your progress through the text portion will be"
440 PRINT" timed, please work at a pace which is comfortable to you."
450 PRINT" This is not a competition to see who finishes first."
460 PRINT
470 PRINT" THANK YOU in advance for your efforts and feedback during"
480 PRINT" this exercise."
490 PRINT
```

500 PRINT
510 PRINT
520 PRINT
530 INPUT"
540 COLOR 15,1
550 CLS
560 COLOR 14,1
570 PRINT
580 PRINT
590 PRINT
600 PRINT
610 PRINT
620 PRINT"
630 COLOR 15,1
640 PRINT
650 PRINT
660 PRINT"
670 PRINT"
680 PRINT"
690 PRINT"
700 PRINT"
710 PRINT"
720 PRINT"
730 PRINT"
740 PRINT"
750 PRINT
760 PRINT
770 PRINT
780 PRINT
790 PRINT
800 INPUT"
810 CLS
820 PRINT
830 PRINT
840 PRINT
850 PRINT
860 PRINT
870 PRINT
880 PRINT"
890 PRINT"
900 PRINT"
910 PRINT"
920 PRINT"
930 PRINT"
940 PRINT"
950 PRINT"
960 PRINT"
970 PRINT"
980 PRINT
990 PRINT
1000 PRINT
1010 PRINT

To continue, press <ENTER>".P

Purchasing Goods and Services"

Buying products and services is a part of everyday" life. Most purchases are planned, especially when the" cost of the goods or services is an appreciable part of an" individual's income. Further, most people seek to maximize" their purchasing power by getting the most for their" dollar. As a result, human nature leads consumers to" demand that a manufacturer provide some assurance that its" products will function as advertised for a specified amount" of time. Product warranties provide such assurances."

To continue, press <ENTER>".P

Since most consumers are not able to witness the" manufacturing process, the assurance of quality through" product warranties can determine whether or not a product" is selected by the consumer. Warranties are the consumer's" avenue for recourse should the purchased good not perform" as promised. Producers who do not warrant their products" can find themselves losing an appreciable portion of their" market as a result. However, such reliance on warranties" is not necessarily the case when the government makes" purchases through contracts."

1020 PRINT
1030 PRINT
1040 INPUT"

To continue, press <ENTER>*,P

1050 CLS
1060 PRINT
1070 PRINT
1080 PRINT
1090 PRINT
1100 PRINT
1110 COLOR 14,1
1120 PRINT"
1130 PRINT
1140 PRINT
1150 COLOR 15,1

Warranties"

1160 PRINT"
1170 PRINT"
1180 PRINT"
1190 PRINT"
1200 PRINT"
1210 PRINT"
1220 PRINT"
1230 PRINT"
1240 PRINT"
1250 PRINT"
1260 PRINT
1270 PRINT
1280 PRINT
1290 PRINT
1300 INPUT"

Much as we consider the warranty to be a manufacturer's" assurance of quality, the Federal Acquisition Regulation" (FAR) defines a warranty as a promise or affirmation given" by a contractor to the government regarding the nature," usefulness, or conditions of the supplies or performance of" services furnished under the contract. Written warranties" on such things as appliances and cars provide the everyday" consumer some degree of confidence in a purchase. Such a" warranty which physically appears in a contract is called" an express warranty."

To continue, press <ENTER>*,P

1310 CLS
1320 PRINT
1330 PRINT
1340 COLOR 14,1
1350 PRINT"
1360 COLOR 15,1
1370 PRINT
1380 PRINT

Express Warranties"

1390 PRINT"
1400 PRINT"
1410 PRINT"
1420 PRINT"
1430 PRINT"
1440 PRINT
1450 PRINT"
1460 PRINT"
1470 PRINT"
1480 PRINT"
1490 PRINT"
1500 PRINT"
1510 PRINT
1520 PRINT"
1530 PRINT"

Recent changes in acquisition policy require that" express warranties, whose durations must be clearly" spelled out in the contract, be included where weapon" system production costs exceed \$100,000 per item or" \$10 million for the total system."

Though it might seem that the government would always" include express warranties in a contract, in reality the" government exercises caution before doing so. The FAR" sets forth five factors which the government must" consider before including express warranty provisions" in a contract."

1. The nature and use of the supplies or services it" wishes to procure (factors such as complexity and"

```

1540 PRINT"                the potential for hidden defects apply here),"
1550 PRINT
1560 INPUT"                                To continue, press <ENTER>","P
1570 CLS
1580 PRINT
1590 PRINT
1600 PRINT
1610 PRINT
1620 PRINT
1630 PRINT
1640 PRINT"                2. The dollar costs associated with the contractor"
1650 PRINT"                    agreeing to extend its liability,"
1660 PRINT
1670 PRINT"                3. Whether or not the government has the resources"
1680 PRINT"                    to administer and enforce a warranty,"
1690 PRINT
1700 PRINT"                4. Whether or not the contracted item is normally"
1710 PRINT"                    warranted in the trade, and"
1720 PRINT
1730 PRINT"                5. The potential for reducing government inspection"
1740 PRINT"                    in light of a warranty."
1750 PRINT
1760 PRINT
1770 PRINT
1780 PRINT
1790 PRINT
1800 INPUT"                                To continue, press <ENTER>","P
1810 CLS
1820 COLOR 11,1
1830 CLS
1840 PRINT
1850 COLOR 14,1
1860 PRINT"                                SELF-TEST QUESTION"
1870 COLOR 11,1
1880 PRINT
1890 PRINT
1900 PRINT"                Indicate your answer to the following."
1910 PRINT
1920 PRINT
1930 PRINT"                The decision to include express warranties in a contract,"
1940 PRINT"                    according to the FAR, need not include consideration of"
1950 PRINT"                    the cost of enforcing the warranty."
1960 PRINT
1970 PRINT"                    a. True"
1980 PRINT"                    b. False"
1990 PRINT
2000 PRINT
2010 INPUT"                Select a or b, and press <ENTER> ","A$
2020 IF A$="A" THEN 2130
2030 IF A$="a" THEN 2130
2040 IF A$="B" THEN 2100
2050 IF A$="b" THEN 2100

```

2060 PRINT
 2070 PRINT
 2080 PRINT* ("A\$") is not a choice. Try again."
 2090 GOTO 2000
 2100 PRINT
 2110 PRINT* Correct. Let's continue."
 2120 GOTO 2100
 2130 PRINT
 2140 PRINT* Incorrect. The correct answer is B. Warranty enforcement"
 2150 PRINT* costs are among many factors the government"
 2160 PRINT* must consider before expressly requiring a"
 2170 PRINT* warranty in a contract."
 2180 PRINT
 2190 INPUT* To continue, press <ENTER>","P
 2200 COLOR 14,1
 2210 CLS
 2220 PRINT
 2230 PRINT
 2240 PRINT
 2250 PRINT* Implied Warranties"
 2260 COLOR 15,1
 2270 PRINT
 2280 PRINT
 2290 PRINT* Implies warranties do not physically appear in the"
 2300 PRINT* contract but are recognized by law as protection to the"
 2310 PRINT* buyer for the useful nature of a purchased good."
 2320 PRINT
 2330 PRINT* To illustrate, consider an appliance purchase for a"
 2340 PRINT* television or toaster. Most warranties which accompany"
 2350 PRINT* such products include a statement indicating the purchaser"
 2360 PRINT* may have additional rights depending on the state in which"
 2370 PRINT* that buyer lives. Such statements indicate the existence"
 2380 PRINT* of implied warranties to protect consumers. These"
 2390 PRINT* warranties may even extend the manufacturer's liability"
 2400 PRINT* past the period stated by an express warranty."
 2410 PRINT
 2420 PRINT
 2430 PRINT
 2440 PRINT
 2450 INPUT* To continue, press <ENTER>","P
 2460 CLS
 2470 PRINT
 2480 PRINT
 2490 PRINT
 2500 PRINT
 2510 PRINT
 2520 PRINT
 2530 PRINT* Further, under government contracts, the Uniform"
 2540 PRINT* Commercial Code (UCC) states implied warranties are"
 2550 PRINT* applicable unless specifically excluded by language written"
 2560 PRINT* into the contract. On numerous occasions, Boards of"
 2570 PRINT* Contract Appeals have relied on UCC principles of implied"

2580 PRINT warranties in resolving government contract disputes."
2590 PRINT
2600 PRINT There are two types of implied warranties which"
2610 PRINT require further illustration."
2620 PRINT
2630 PRINT
2640 PRINT
2650 PRINT
2660 PRINT
2670 PRINT
2680 PRINT
2690 INPUT To continue, press <ENTER>*,P
2700 CLS
2710 PRINT
2720 PRINT
2730 PRINT
2740 PRINT
2750 PRINT
2760 PRINT
2770 PRINT
2780 PRINT When purchasing an item for its generally advertised"
2790 PRINT purpose, like a hammer for driving in nails, an implied"
2800 PRINT warranty of merchantability is in effect. Such a warranty"
2810 PRINT requires that goods are appropriate for the purpose for"
2820 PRINT which they are normally sold."
2830 PRINT
2840 PRINT If the government wants to waive an implied warranty"
2850 PRINT of merchantability in its contracts, it can do so either"
2860 PRINT orally or in writing."
2870 PRINT
2880 PRINT
2890 PRINT
2900 PRINT
2910 PRINT
2920 PRINT
2930 INPUT To continue, press <ENTER>*,P
2940 CLS
2950 PRINT
2960 PRINT
2970 PRINT
2980 PRINT
2990 PRINT
3000 PRINT
3010 PRINT
3020 PRINT
3030 PRINT Now suppose the salesperson who sells hammers tells"
3040 PRINT buyers, when asked, that the hammer is also ideal for"
3050 PRINT scraping ice off windshields during winter months. Here"
3060 PRINT an implied warranty called fitness for a particular purpose"
3070 PRINT is in effect. Such a warranty relies on the judgement of"
3080 PRINT the seller to select suitable goods. Warranties for"
3090 PRINT fitness can only be waived in writing."

```

3100 PRINT
3110 PRINT
3120 PRINT
3130 PRINT
3140 PRINT
3150 PRINT
3160 PRINT
3170 INPUT*
3180 COLOR 11,1
3190 CLS
3200 PRINT
3210 COLOR 14,1
3220 PRINT*
3230 COLOR 11,1
3240 PRINT
3250 PRINT
3260 PRINT*
3270 PRINT
3280 PRINT
3290 PRINT*
3300 PRINT
3310 PRINT
3320 PRINT*
3330 PRINT*
3340 PRINT*
3350 PRINT*
3360 PRINT
3370 PRINT
3380 INPUT*
3390 IF A$="A" THEN 3520
3400 IF A$="a" THEN 3520
3410 IF A$="B" THEN 3520
3420 IF A$="b" THEN 3520
3430 IF A$="C" THEN 3490
3440 IF A$="c" THEN 3490
3450 PRINT
3460 PRINT
3470 PRINT*
3480 GOTO 3370
3490 PRINT
3500 PRINT*
3510 GOTO 3560
3520 PRINT
3530 PRINT*
3540 PRINT*
3550 PRINT*
3560 PRINT
3570 INPUT*
3580 COLOR 14,1
3590 CLS
3600 PRINT
3610 PRINT*

```

To continue, press <ENTER>*,P

SELF-TEST QUESTION*

Complete the following statement."

According to the UCC, implied warranties are applicable:"

- a. unless waived by the contracting officer."
- b. unless a Certificate of Conformance is submitted" by the contractor."
- c. unless excluded by written notice in the contract."

Select a, b, or c, and press <ENTER> *,A\$

("A\$") is not a choice. Try again."

Correct. Let's continue."

Incorrect. The correct answer is C. Implied warranties" are applicable unless specifically excluded" in the written contract."

To continue, press <ENTER>*,P

Warranty Breaches"

```

3620 COLOR 15,1
3630 PRINT
3640 PRINT
3650 PRINT"      Options available to an individual who is the victim of"
3660 PRINT"      a warranty breach (default) are somewhat similar to those"
3670 PRINT"      the government might take against a contractor. Should a"
3680 PRINT"      breach (default) occur, the government contracting officer"
3690 PRINT"      has two options."
3700 PRINT
3710 PRINT"      1. the contractor may be required to correct or"
3720 PRINT"      replace nonconforming supplies (or parts), or"
3730 PRINT
3740 PRINT"      2. the government may retain the nonconformables and"
3750 PRINT"      require the contractor to make an equitable"
3760 PRINT"      adjustment in price."
3770 PRINT
3780 PRINT"      In either case, the FAR stipulates that the"
3790 PRINT"      contractor's obligation to repair, replace, or adjust"
3800 PRINT"      price will include appropriate labor and material costs."
3810 PRINT
3820 PRINT
3830 INPUT"                                     To continue, press <ENTER> ",P
3840 COLOR 11,1
3850 CLS
3860 PRINT
3870 COLOR 14,1
3880 PRINT"                                SELF-TEST QUESTION"
3890 COLOR 11,1
3900 PRINT
3910 PRINT
3920 PRINT"      Indicate your answer to the following."
3930 PRINT
3940 PRINT
3950 PRINT"      If a product has a defect and the contractor breaches the"
3960 PRINT"      warranty agreement covering the product, the government may"
3970 PRINT"      require the contractor to adjust the product's price."
3980 PRINT
3990 PRINT"      a. True"
4000 PRINT"      b. False"
4010 PRINT
4020 PRINT
4030 INPUT"      Select a or b, and press <ENTER> ",A$
4040 IF A$="A" THEN 4120
4050 IF A$="a" THEN 4120
4060 IF A$="B" THEN 4150
4070 IF A$="b" THEN 4150
4080 PRINT
4090 PRINT
4100 PRINT"      ("A$") is not a choice. Try again."
4110 GOTO 4020
4120 PRINT
4130 PRINT"      Correct. Let's continue."

```


4140 GOTO 4200
 4150 PRINT
 4160 PRINT"
 4170 PRINT"
 4180 PRINT"
 4190 PRINT"
 4200 PRINT
 4210 INPUT"
 4220 COLOR 15,1
 4230 CLS
 4240 PRINT
 4250 PRINT
 4260 PRINT
 4270 PRINT
 4280 PRINT
 4290 PRINT"
 4300 PRINT"
 4310 PRINT"
 4320 PRINT"
 4330 PRINT"
 4340 PRINT"
 4350 PRINT"
 4360 PRINT"
 4370 PRINT"
 4380 PRINT"
 4390 PRINT"
 4400 PRINT"
 4410 PRINT
 4420 PRINT
 4430 PRINT
 4440 PRINT
 4450 PRINT
 4460 INPUT"
 4470 CLS
 4480 PRINT
 4490 PRINT
 4500 COLOR 14,1
 4510 PRINT"
 4520 PRINT
 4530 COLOR 15,1
 4540 PRINT"
 4550 PRINT"
 4560 PRINT"
 4570 PRINT"
 4580 PRINT"
 4590 PRINT"
 4600 PRINT"
 4610 PRINT"
 4620 PRINT"
 4630 PRINT"
 4640 PRINT"
 4650 PRINT"

Incorrect. The correct answer is A. The government may
 require a contractor to make an equitable
 adjustment in price should the contractor
 breach a warranty."

To continue, press <ENTER>".P

The preceding discussion highlights the implications
 of both express and implied warranties. However, as noted
 earlier, the emphasis on warranties is greater for the
 individual than for the government because the latter has
 an insight into the development of a product that we, as
 individual buyers, do not obtain. As a result, though
 important for many government programs and even mandated
 under certain conditions, warranties are considered the
 government's second line of defense when it makes a
 purchase under a contract. The government's active
 involvement in the development process is its primary means
 of ensuring quality from a contractor."

To continue, press <ENTER>".P

Inspection"

Given the opportunity, an individual will investigate
 the functionality and esthetics (if applicable) of a
 product before purchasing. Test drives and expert
 (mechanic) opinion, for example, are ways to ensure we
 make intelligent car buying decisions. Often, however,
 an individual's ability to really inspect an item is
 limited such that he or she ends up relying more on
 warranties for protection should something go wrong with
 the purchase. This is contrary to how the government
 operates; it uses inspection as its primary means of
 ensuring quality. The amount of government inspection
 depends on two things:"

```

4660 PRINT
4670 PRINT"      1. the contractor involved in the procurement, and"
4680 PRINT
4690 PRINT"      2. the nature of the purchase (complexities, etc.)."
4700 PRINT
4710 PRINT
4720 INPUT"      To continue, press <ENTER> ",P
4730 CLS
4740 PRINT
4750 PRINT
4760 PRINT
4770 PRINT
4780 PRINT"      Whether an individual buying a product, or the"
4790 PRINT"      government acting in a proprietary manner on a system"
4800 PRINT"      acquisition, the contractor is held responsible for"
4810 PRINT"      operating and maintaining adequate inspection programs."
4820 PRINT"      The FAR specifies that the government shall rely on the"
4830 PRINT"      contractor to perform all necessary inspections and tests."
4840 PRINT"      The exceptions to this rule, as deemed necessary by the"
4850 PRINT"      contracting officer, can occur at either of the following;"
4860 PRINT
4870 PRINT"      1. any time when the government has a need to perform"
4880 PRINT"      such activities to check the contractor's internal"
4890 PRINT"      work processes, and"
4900 PRINT
4910 PRINT"      2. in advance of accepting the contractor's offer of"
4920 PRINT"      the final product."
4930 PRINT
4940 PRINT
4950 PRINT
4960 INPUT"      To continue, press <ENTER> ",P
4970 COLOR 11,1
4980 CLS
4990 PRINT
5000 COLOR 14,1
5010 PRINT"      SELF-TEST QUESTION"
5020 COLOR 11,1
5030 PRINT
5040 PRINT
5050 PRINT"      Before continuing, indicate your answer to the following."
5060 PRINT
5070 PRINT
5080 PRINT"      Without exception, the FAR requires a contractor to perform"
5090 PRINT"      all necessary inspection activities."
5100 PRINT
5110 PRINT"      a. True"
5120 PRINT"      b. False"
5130 PRINT
5140 PRINT
5150 INPUT"      Select a or b, and press <ENTER> ",A$
5160 IF A$="A" THEN 5270
5170 IF A$="a" THEN 5270

```

```

5180 IF A$="B" THEN 5240
5190 IF A$="b" THEN 5240
5200 PRINT
5210 PRINT
5220 PRINT"      ("A$") is not a choice. Try again."
5230 GOTO 5140
5240 PRINT
5250 PRINT"      Correct. Let's continue."
5260 GOTO 5310
5270 PRINT
5280 PRINT"      Incorrect. The correct answer is B. The FAR provides"
5281 PRINT"      contracting officers with several exceptions"
5282 PRINT"      to the general guidance that a contractor"
5283 PRINT"      perform all inspections and tests."
5310 PRINT
5320 INPUT"                                     To continue, press <ENTER>";P
5330 COLOR 15,1
5340 CLS
5350 PRINT
5360 PRINT
5370 PRINT
5380 PRINT
5390 PRINT
5400 PRINT
5410 PRINT
5420 PRINT
5430 PRINT
5440 PRINT"      Now let's turn from our comparison of individual"
5450 PRINT"      versus government perspectives and consider a scenario"
5460 PRINT"      where two program managers approach the inspection"
5470 PRINT"      requirements of their respective programs differently."
5480 PRINT
5490 PRINT
5500 PRINT
5510 PRINT
5520 PRINT
5530 PRINT
5540 PRINT
5550 PRINT
5560 PRINT
5570 INPUT"                                     To continue, press <ENTER>";P
5580 CLS
5590 PRINT
5600 PRINT
5610 PRINT
5620 PRINT
5630 COLOR 14,1
5640 PRINT"      Government Inspection"
5650 PRINT
5660 PRINT
5670 COLOR 15,1
5680 PRINT"      Capt A is the program manager for an Electro, Inc."

```

5690 PRINT"
5700 PRINT"
5710 PRINT"
5720 PRINT"
5730 PRINT"
5740 PRINT"
5750 PRINT"
5760 PRINT"
5770 PRINT"
5780 PRINT"
5790 PRINT
5800 PRINT
5810 PRINT
5820 PRINT
5830 INPUT"
5840 CLS
5850 PRINT
5860 PRINT
5870 PRINT
5880 PRINT
5890 PRINT"
5900 PRINT"
5910 PRINT"
5920 PRINT"
5930 PRINT"
5940 PRINT"
5950 PRINT"
5960 PRINT"
5970 PRINT"
5980 PRINT"
5990 PRINT"
6000 PRINT"
6010 PRINT"
6020 PRINT
6030 PRINT
6040 PRINT
6050 PRINT
6060 PRINT
6070 INPUT"
6080 CLS
6090 PRINT
6100 PRINT
6110 PRINT
6120 PRINT
6130 PRINT
6140 PRINT
6150 PRINT
6160 PRINT"
6170 PRINT"
6180 PRINT"
6190 PRINT"
6200 PRINT"

contract. He has conducted weekly visits to Electro's" facility to check progress on an electronic sensing device" Electro is building for a major fighter acquisition" contract. To stage the activity, A typically calls his" contractor counterpart to arrange a mutually agreeable" time for him and the rest of the government team to visit" Electro's local plant. An upcoming inspection, which" includes a demonstration of device functions completed thus" far, as well as a review of Electro's inspection associated" documentation, is scheduled to take no more than two hours."

To continue, press <ENTER>".P

Capt B, managing an identical program at Electro," handles his inspections differently. He visits the" Electro facility daily asking questions, making" suggestions, and requesting special demonstrations of the" device as it develops. One day, while working several" short suspenses for his boss, he realizes he won't have" time to make the hour-long drive to the contractor's plant." Calling his counterparts at Electro, he requests they bring" the device, along with appropriate test equipment, to the" military base so he and the rest of the government team can" complete their daily monitoring. This request will cause" Electro to spend several hours disassembling, packing," and reassembling the unit."

To continue, press <ENTER>".P

Electro complies and a week later sends the" government contracting officer a bill for the inspection" conducted at the base. Further, an additional amount is" billed for what Electro claims are unnecessary delays to" their progress due to excessive oversight and inspection by"

6210 PRINT"
6220 PRINT"
6230 PRINT
6240 PRINT
6250 PRINT
6260 PRINT
6270 PRINT
6280 PRINT
6290 PRINT
6300 PRINT
6310 INPUT"

the government. In Electro's estimation, such delays will"
cause them to miss their product delivery date by one week."

To continue, press <ENTER>","P

6320 CLS
6330 PRINT
6340 PRINT
6350 PRINT
6360 PRINT
6370 PRINT
6380 PRINT
6390 PRINT
6400 PRINT
6410 PRINT"
6420 PRINT"
6430 PRINT"
6440 PRINT"
6450 PRINT"
6460 PRINT"
6470 PRINT
6480 PRINT
6490 PRINT
6500 PRINT
6510 PRINT
6520 PRINT
6530 PRINT
6540 PRINT
6550 INPUT"

This scenario, though somewhat simplistic given the"
complexities which can surround a contract, does highlight"
several important concerns the government must consider in"
the performance of inspections. These concerns are for"
the time, place, and cost of government inspection. Let's"
consider each of these concerns separately."

To continue, press <ENTER>","P

6560 COLOR 14,1
6570 CLS
6580 PRINT
6590 PRINT
6600 PRINT"
6610 PRINT
6620 PRINT
6630 COLOR 15,1

Time of Inspection"

6640 PRINT"
6650 PRINT"
6660 PRINT"
6670 PRINT"
6680 PRINT"
6690 PRINT"
6700 PRINT"
6710 PRINT"
6720 PRINT"

The FAR states the government has the right to inspect"
at all...times, including the period of manufacture, and"
in any event before acceptance. However, caution must"
be exercised. The government can be exposed to potential"
liability if it causes undue or unnecessary delay in"
the contractor's performance. Though we don't know"
Electro's performance history or a myriad of other issues,"
it's easy to see that the extent of Capt B's inspection"
process could lead to a delay claim by the contractor."

6730 PRINT"
6740 PRINT"
6750 PRINT"
6760 PRINT
6770 PRINT"
6780 PRINT"
6790 PRINT"
6800 PRINT
6810 INPUT"
6820 CLS
6830 PRINT
6840 PRINT
6850 PRINT
6860 PRINT
6870 PRINT
6880 PRINT
6890 PRINT
6900 PRINT"
6910 PRINT"
6920 PRINT"
6930 PRINT"
6940 PRINT"
6950 PRINT"
6960 PRINT"
6970 PRINT"
6980 PRINT"
6990 PRINT
7000 PRINT
7010 PRINT
7020 PRINT
7030 PRINT
7040 PRINT
7050 INPUT"
7060 COLOR 11,1
7070 CLS
7080 PRINT
7090 COLOR 14,1
7100 PRINT"
7110 COLOR 11,1
7120 PRINT
7130 PRINT
7140 PRINT"
7150 PRINT
7160 PRINT
7170 PRINT"
7180 PRINT
7190 PRINT
7200 PRINT"
7210 PRINT"
7220 PRINT"
7230 PRINT
7240 PRINT

Fortunately, the courts do not consider all delays"
unreasonable; contractors must anticipate some inspection"
related delays in preparing contract proposals."

Also, while the FAR indicates inspection will, in"
general, take place prior to government acceptance, a"
provision for Certificate of Conformance may be applied."

To continue, press <ENTER>".P

Certificate's of Conformance, offered by the"
contractor for acceptance by the government (like a"
guarantee of quality) can be used as the sole"
consideration for acceptance and is generally allowed"
only in those situations where either small losses would"
be incurred or the contractor's reputation and past"
performance warrant such an award. However, even if this"
certificate is used, the government still reserves the"
right to inspect."

To continue, press <ENTER>".P

SELF-TEST QUESTION"

Complete the following statement."

A Certificate of Conformance is submitted by:"

- a. the contracting officer."
- b. the contractor."
- c. either a or b, depending upon the circumstance."

```

7250 INPUT"      Select a, b, or c, and press <ENTER> ",A$
7260 IF A$="A" THEN 7390
7270 IF A$="a" THEN 7390
7280 IF A$="B" THEN 7360
7290 IF A$="b" THEN 7360
7300 IF A$="C" THEN 7390
7310 IF A$="c" THEN 7390
7320 PRINT
7330 PRINT
7340 PRINT"      ("A$") is not a choice. Try again."
7350 GOTO 7240
7360 PRINT
7370 PRINT"      Correct. Let's continue."
7380 GOTO 7430
7390 PRINT
7400 PRINT"      Incorrect. The correct answer is B. The contractor"
7410 PRINT"      submits a Certificate of Conformance for the"
7420 PRINT"      government's consideration."
7430 PRINT
7440 INPUT"                                     To continue, press <ENTER> ",P
7450 COLOR 14,1
7460 CLS
7470 PRINT
7480 PRINT
7490 PRINT"                                     Place of Inspection"
7500 PRINT
7510 PRINT
7520 COLOR 15,1
7530 PRINT"      The FAR requires each contract to specify the place or"
7540 PRINT"      places where the government reserves the right to perform"
7550 PRINT"      inspection. The FAR offers five recommendations for the"
7560 PRINT"      location of inspections at a specific source:"
7570 PRINT
7580 PRINT"      1. if use of any other place would cause"
7590 PRINT"      uneconomical disassembly or destructive testing,"
7600 PRINT
7610 PRINT"      2. if considerable loss would result from making and"
7620 PRINT"      shipping unacceptable products,"
7630 PRINT
7640 PRINT"      3. if special instruments, facilities, etc., are"
7650 PRINT"      available only at the source,"
7660 PRINT
7670 PRINT
7680 PRINT
7690 PRINT
7700 INPUT"                                     To continue, press <ENTER> ",P
7710 CLS
7720 PRINT
7730 PRINT
7740 PRINT
7750 PRINT
7760 PRINT

```

7770 PRINT
 7780 PRINT
 7790 PRINT
 7800 PRINT"
 7810 PRINT"
 7820 PRINT
 7830 PRINT"
 7840 PRINT"
 7850 PRINT
 7860 PRINT
 7870 PRINT
 7880 PRINT
 7890 PRINT
 7900 PRINT
 7910 PRINT
 7920 PRINT
 7930 PRINT
 7940 INPUT"
 7950 COLOR 14,1
 7960 CLS
 7970 PRINT
 7980 PRINT
 7990 PRINT
 8000 PRINT
 8010 PRINT
 8020 PRINT
 8030 PRINT"
 8040 PRINT
 8050 PRINT
 8060 COLOR 15,1
 8070 PRINT"
 8080 PRINT"
 8090 PRINT"
 8100 PRINT"
 8110 PRINT"
 8120 PRINT"
 8130 PRINT"
 8140 PRINT
 8150 PRINT
 8160 PRINT
 8170 PRINT
 8180 PRINT
 8190 PRINT
 8200 INPUT"
 8210 CLS
 8220 PRINT
 8230 PRINT
 8240 PRINT
 8250 PRINT
 8260 PRINT
 8270 PRINT"
 8280 PRINT"

4. if government inspection during contract"
performance is deemed essential, or"
5. if, for any other reason, it is seen as in the"
best interest of the government."

To continue, press <ENTER>","P

Costs of Inspection"

If inspection is performed at the contractor's or"
 subcontractor's premises, the contractor will provide"
 facilities and assistance without added charge. If"
 conducted at other than contractor premises, the"
 government bears the expense. The government also pays"
 whenever it requires special inspection equipment,"
 regardless of where the activity occurs."

To continue, press <ENTER>","P

We should remember, at this point, the two purposes"
 Capt A set out to accomplish with his inspection. Not"

8290 PRINT"
8300 PRINT"
8310 PRINT"
8320 PRINT"
8330 PRINT"
8340 PRINT"
8350 PRINT"
8360 PRINT
8370 PRINT"
8380 PRINT
8390 PRINT
8400 PRINT
8410 PRINT
8420 PRINT
8430 PRINT
8440 INPUT"
8450 CLS
8460 PRINT
8470 PRINT
8480 PRINT
8490 PRINT
8500 PRINT
8510 PRINT
8520 PRINT"
8530 PRINT"
8540 PRINT
8550 PRINT"
8560 PRINT
8570 PRINT"
8580 PRINT"
8590 PRINT"
8600 PRINT"
8610 PRINT
8620 PRINT
8630 PRINT
8640 PRINT
8650 PRINT
8660 PRINT
8670 PRINT
8680 INPUT"
8690 COLOR 11,1
8700 CLS
8710 PRINT
8720 COLOR 14,1
8730 PRINT"
8740 COLOR 11,1
8750 PRINT
8760 PRINT
8770 PRINT"
8780 PRINT
8790 PRINT
8800 PRINT"

only did his team witness a demonstration of the
functionality of the device, they also reviewed Electro's
inspection documentation. This review of documentation
is in keeping with the FAR requirement which states a
contractor shall provide and maintain an inspection
system acceptable to the government. It further requires
the contractor to do four things:"

1. control the quality of its supplies and services,"

To continue, press <ENTER>*,P

2. tender for acceptance only supplies and services"
which conform to contract requirements,"
3. ensure vendors have adequate quality control, and"
4. maintain records of inspection activities which"
evidence the fact that supplies and services"
conform to the contract, and furnish the"
government such information as required."

To continue, press <ENTER>*,P

SELF-TEST QUESTION"

Indicate your answer to the following."

The FAR specifies that a contractor must only submit"

```

8810 PRINT"      products which conform to contract requirements."
8820 PRINT
8830 PRINT"      a. True"
8840 PRINT"      b. False"
8850 PRINT
8860 PRINT
8870 INPUT"      Select a or b, and press <ENTER> ",A$
8880 IF A$="A" THEN 8960
8890 IF A$="a" THEN 8960
8900 IF A$="B" THEN 8990
8910 IF A$="b" THEN 8990
8920 PRINT
8930 PRINT
8940 PRINT"      ("A$") is not a choice. Try again."
8950 GOTO 8860
8960 PRINT
8970 PRINT"      Correct. Let's continue."
8980 GOTO 9030
8990 PRINT
9000 PRINT"      Incorrect. The correct answer is A. The FAR mandates"
9010 PRINT"      that a contractor only submit products which"
9020 PRINT"      conform to the requirements of the contract."
9030 PRINT
9040 INPUT"      To continue, press <ENTER> ",P
9050 COLOR 15,1
9060 CLS
9070 PRINT
9080 PRINT
9090 PRINT
9100 PRINT
9110 PRINT
9120 PRINT
9130 PRINT
9140 PRINT
9150 PRINT"      Should a contractor's system of inspection fail to"
9160 PRINT"      screen defective items or practices, courts have ruled"
9170 PRINT"      the government has the right to decline any further"
9180 PRINT"      inspections. However, government actions to reject a"
9190 PRINT"      contractor's performance must follow specific guidelines."
9200 PRINT
9210 PRINT
9220 PRINT
9230 PRINT
9240 PRINT
9250 PRINT
9260 PRINT
9270 PRINT
9280 PRINT
9290 INPUT"      To continue, press <ENTER> ",P
9300 COLOR 14,1
9310 CLS
9320 PRINT

```

9330 PRINT
9340 PRINT
9350 PRINT
9360 PRINT
9370 PRINT
9380 PRINT"
9390 PRINT
9400 PRINT
9410 COLOR 15,1
9420 PRINT"
9430 PRINT"
9440 PRINT"
9450 PRINT"
9460 PRINT"
9470 PRINT"
9480 PRINT"
9490 PRINT"
9500 PRINT
9510 PRINT
9520 PRINT
9530 PRINT
9540 PRINT
9550 INPUT"
9560 CLS
9570 PRINT
9580 PRINT
9590 PRINT
9600 PRINT
9610 PRINT
9620 PRINT
9630 PRINT"
9640 PRINT"
9650 PRINT"
9660 PRINT"
9670 PRINT"
9680 PRINT"
9690 PRINT"
9700 PRINT"
9710 PRINT"
9720 PRINT"
9730 PRINT
9740 PRINT
9750 PRINT
9760 PRINT
9770 PRINT
9780 PRINT
9790 INPUT"
9800 CLS
9810 PRINT
9820 PRINT
9830 PRINT
9840 PRINT

Rejection of Goods/Services"

Now that we've established both government and contractor responsibilities for inspections, let's return to our program managers. Consider a point in time where each manager has just completed final inspection four (4) weeks ahead of the contract delivery date. Unfortunately, both devices failed in their ability to resist electronic jamming (interference) as required by the government developed and approved product specification."

To continue, press <ENTER>","P

While present at the contractor's facility (just after inspection), Capt A immediately told Electro he intended to reject the device, citing the specification to which the product did not conform. Since final inspection for acceptability had occurred ahead of schedule, Electro asked A's permission to correct the defect and retest for acceptance no later than the originally contracted delivery date. Since the defect appeared repairable within the remaining contract time, Capt A agreed to Electro's request."

To continue, press <ENTER>","P

9850 PRINT
9860 PRINT
9870 PRINT"
9880 PRINT"
9890 PRINT"
9900 PRINT"
9910 PRINT"
9920 PRINT"
9930 PRINT"
9940 PRINT"
9950 PRINT"
9960 PRINT"
9970 PRINT
9980 PRINT
9990 PRINT
10000 PRINT
10010 PRINT
10020 PRINT
10030 INPUT"
10040 CLS
10050 PRINT
10060 PRINT
10070 PRINT
10080 PRINT
10090 PRINT
10100 PRINT
10110 PRINT
10120 PRINT"
10130 PRINT"
10140 PRINT
10150 PRINT"
10160 PRINT"
10170 PRINT"
10180 PRINT"
10190 PRINT
10200 PRINT
10210 PRINT
10220 PRINT
10230 PRINT
10240 PRINT
10250 PRINT
10260 PRINT
10270 INPUT"
10280 CLS
10290 PRINT
10300 PRINT
10310 PRINT
10320 PRINT
10330 PRINT
10340 PRINT"
10350 PRINT"
10360 PRINT"

On the other hand Capt B, though recognizing the" defect, gave no indication that the government might reject" the device. Instead, he asked Electro to transport the" device out to the base. There, Capt B intended to have his" team of engineers further analyze the item without" contractor interference to see if the government should" consider accepting the item despite its obvious defect." The contracted delivery date passed and Capt B had still" not communicated any sort of rejection to Electro for the" nonconforming product."

To continue, press <ENTER>","P

Six (6) key points about rejecting defective supplies" or services need to be underlined from the above passages:"

1. Nonconformance most often results in rejection" when performance, durability, operational" effectiveness, appearance, or weight have been" adversely affected."

To continue, press <ENTER>","P

2. Notice of rejection must be given to the" contractor within a reasonable time. However," reasonable time can mean many things and should be"

10370 PRINT" specified in the contract. If not specified,"
 10380 PRINT" courts have ruled that the government should"
 10390 PRINT" inform the contractor of its intent to reject the"
 10400 PRINT" contractor's product as soon as the government"
 10410 PRINT" makes such a determination. Otherwise, as in"
 10420 PRINT" Capt B's case, an implied acceptance of the"
 10430 PRINT" contractor's product can be assumed on the"
 10440 PRINT" government's behalf."
 10450 PRINT
 10460 PRINT
 10470 PRINT
 10480 PRINT
 10490 PRINT
 10500 PRINT
 10510 INPUT" To continue, press <ENTER>".P
 10520 CLS
 10530 PRINT
 10540 PRINT
 10550 PRINT
 10560 PRINT
 10570 PRINT
 10580 PRINT
 10590 PRINT" 3. Reasons for the government's rejection must be"
 10600 PRINT" given to the contractor. This notice does not"
 10610 PRINT" need to be in writing unless--"
 10620 PRINT
 10630 PRINT" a. the rejection is communicated at a place"
 10640 PRINT" other than the contractor's facilities,"
 10650 PRINT
 10660 PRINT" b. contractor performance is inexcusably late, or"
 10670 PRINT
 10680 PRINT" c. the contractor continues to submit"
 10690 PRINT" nonconforming products."
 10700 PRINT
 10710 PRINT
 10720 PRINT
 10730 PRINT
 10740 PRINT
 10750 INPUT" To continue, press <ENTER>".P
 10760 COLOR 11,1
 10770 CLS
 10780 PRINT
 10790 COLOR 14,1
 10800 PRINT" SELF-TEST QUESTION"
 10810 COLOR 11,1
 10820 PRINT
 10830 PRINT
 10840 PRINT" Indicate your answer to the following."
 10850 PRINT
 10860 PRINT
 10870 PRINT" Interfering with the contractor's ownership of its product"
 10880 PRINT" can be seen as an implied acceptance of that product"

```

10890 PRINT"      by the government."
10900 PRINT
10910 PRINT"      a. True"
10920 PRINT"      b. False"
10930 PRINT
10940 PRINT
10950 INPUT"      Select a or b, and press <ENTER> ",A$
10960 IF A$="A" THEN 11040
10970 IF A$="a" THEN 11040
10980 IF A$="B" THEN 11070
10990 IF A$="b" THEN 11070
11000 PRINT
11010 PRINT
11020 PRINT"      ("A$") is not a choice. Try again."
11030 GOTO 10940
11040 PRINT
11050 PRINT"      Correct. Let's continue."
11060 GOTO 11130
11070 PRINT
11080 PRINT"      Incorrect. The correct answer is A. Courts of law have"
11090 PRINT"      ruled that government interference with a"
11100 PRINT"      contractor's ownership of (ability to control)"
11110 PRINT"      a product can constitute an implied acceptance"
11120 PRINT"      of that product."
11130 PRINT
11140 INPUT"      To continue, press <ENTER> ",P
11150 COLOR 15,1
11160 CLS
11170 PRINT
11180 PRINT
11190 PRINT
11200 PRINT
11210 PRINT
11220 PRINT
11230 PRINT"      4. Numerous options are available to the government in"
11240 PRINT"      the event the contractor's product is found to be"
11250 PRINT"      defective. As seen above, if defects are deemed"
11260 PRINT"      repairable within the normal contract period, the"
11270 PRINT"      government must allow the contractor the"
11280 PRINT"      opportunity to make such corrections. In addition,"
11290 PRINT"      if the contractor delivers ahead of schedule and"
11300 PRINT"      reasonably believes the product will be accepted,"
11310 PRINT"      it is authorized a reasonable amount of time"
11320 PRINT"      beyond the delivery date to make corrections."
11330 PRINT
11340 PRINT
11350 PRINT
11360 PRINT
11370 PRINT
11380 INPUT"      To continue, press <ENTER> ",P
11390 CLS
11400 PRINT

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11410 PRINT
11420 PRINT
11430 PRINT"      5. If final inspection is performed (per the contract)"
11440 PRINT"      at a government facility, government rejection"
11450 PRINT"      would require the contractor to remove the"
11460 PRINT"      defective product unless authorized to complete"
11470 PRINT"      corrections-in-place. If rejected items are not"
11480 PRINT"      removed promptly the government can terminate the"
11490 PRINT"      contract (unlikely in most situations) or remove,"
11500 PRINT"      replace, or repair the item at the contractor's"
11510 PRINT"      expense. However, termination only applies if the"
11520 PRINT"      defects are judged not repairable within the"
11530 PRINT"      delivery schedule specified by the contract."
11540 PRINT
11550 PRINT"      6. Should the government decide to accept defective"
11560 PRINT"      goods or services (which it can do in its own best"
11570 PRINT"      interest), it can require an equitable price"
11580 PRINT"      reduction from the contractor."
11590 PRINT
11600 PRINT
11610 PRINT
11620 INPUT"                                     To continue, press <ENTER> ",P
11630 COLOR 11,1
11640 CLS
11650 PRINT
11660 COLOR 14,1
11670 PRINT"                                SELF-TEST QUESTION"
11680 COLOR 11,1
11690 PRINT
11700 PRINT
11710 PRINT"      Indicate your answer to the following."
11720 PRINT
11730 PRINT
11740 PRINT"      A contractor can be authorized time beyond the delivery"
11750 PRINT"      date to make corrections to a product."
11760 PRINT
11770 PRINT"      a. True"
11780 PRINT"      b. False"
11790 PRINT
11800 PRINT
11810 INPUT"      Select a or b, and press <ENTER> ",A$
11820 IF A$="A" THEN 11900
11830 IF A$="a" THEN 11900
11840 IF A$="B" THEN 11930
11850 IF A$="b" THEN 11930
11860 PRINT
11870 PRINT
11880 PRINT"      ("A$") is not a choice. Try again."
11890 GOTO 11800
11900 PRINT
11910 PRINT"      Correct. Let's continue."
11920 GOTO 12000

```

11930 PRINT

11940 PRINT"

11950 PRINT"

11960 PRINT"

11970 PRINT"

11980 PRINT"

11990 PRINT"

12000 PRINT

12010 INPUT"

12020 COLOR 15,1

12030 CLS

12040 PRINT

12050 PRINT

12060 PRINT

12070 PRINT

12080 PRINT

12090 PRINT

12100 PRINT

12110 PRINT

12120 PRINT

12130 PRINT"

12140 PRINT"

12150 PRINT"

12160 PRINT

12170 PRINT

12180 PRINT

12190 PRINT

12200 PRINT

12210 PRINT

12220 PRINT

12230 PRINT

12240 PRINT

12250 PRINT

12260 INPUT"

12270 CLS

12280 PRINT

12290 PRINT

12300 PRINT

12310 COLOR 14,1

12320 PRINT"

12330 COLOR 15,1

12340 PRINT

12350 PRINT

12360 PRINT"

12370 PRINT"

12380 PRINT"

12390 PRINT"

12400 PRINT"

12410 PRINT"

12420 PRINT"

12430 PRINT"

12440 PRINT

Incorrect. The correct answer is A. If the contractor" delivers ahead of schedule and reasonably" believes the product will be accepted, yet" minor defects are found, the contractor must" be authorized time beyond the contract date" to make corrections."

To continue, press <ENTER>".P

So far we have only considered the rejection of goods" or services. Let's consider the other possibility--for" acceptance of the contractor's performance."

To continue, press <ENTER>".P

Acceptance of Goods/Services"

In general, government acceptance can occur before, at" the time of, or even after deliver of the product. In" addition, acceptance can occur implicitly, demonstrated in" our example when Capt B failed to reject the nonconforming" electronic device within a reasonable time. His actions" were just as binding as if he had explicitly accepted the" item by forwarding written notice of that fact through his" contracting officer."

12450 PRINT"
12460 PRINT"
12470 PRINT"
12480 PRINT"
12490 PRINT
12500 PRINT
12510 PRINT
12520 INPUT"
12530 CLS
12540 PRINT
12550 PRINT
12560 PRINT
12570 PRINT"
12580 PRINT"
12590 PRINT"
12600 PRINT"
12610 PRINT"
12620 PRINT"
12630 PRINT"
12640 PRINT"
12650 PRINT"
12660 PRINT"
12670 PRINT
12680 PRINT"
12690 PRINT"
12700 PRINT"
12710 PRINT"
12720 PRINT"
12730 PRINT
12740 PRINT
12750 PRINT
12760 INPUT"
12770 CLS
12780 PRINT
12790 PRINT
12800 PRINT
12810 PRINT
12820 PRINT
12830 PRINT
12840 PRINT
12850 PRINT"
12860 PRINT"
12870 PRINT"
12880 PRINT"
12890 PRINT"
12900 PRINT"
12910 PRINT"
12920 PRINT"
12930 PRINT
12940 PRINT
12950 PRINT
12960 PRINT

To summarize, whether acceptance is explicit or" implicit, the result is the same: aside from the four" specific exceptions we are about to consider, acceptance" is conclusive."

To continue, press <ENTER>","P

A contractor is not liable for defects which the" government should have discovered during the inspection" process. Such defects, called patent defects, often" result when the government does not exercise its right to" inspect. However, not all defects are detectable. For" example, a frequent problem in software acquisitions is" that while test programs ensure all required functions are" achievable, every conceivable route through software loops" is not traversed. As a result, defects often crop up after" acceptance when the government begins using the product."

This first exception, called a latent defect, remains" hidden from knowledge and sight, and is not found through" reasonable inspection or care. Unlike the patent defect" first described, latent defects overturn the conclusiveness" of government acceptance."

To continue, press <ENTER>","P

Another condition which negates government acceptance" is one where a contractor deliberately misrepresents (or" conceals) the facts with an intent to mislead, resulting in" damages to the government. Such cases, called fraud, occur" infrequently and are extremely difficult to prove. When" the government has evidence of fraud it usually pursues" criminal as well as civil actions against the contractor." If successful, the government receives double damages."

12970 PRINT
12980 PRINT
12990 PRINT
13000 INPUT"
13010 CLS
13020 PRINT
13030 PRINT
13040 PRINT
13050 PRINT
13060 PRINT
13070 PRINT"
13080 PRINT"
13090 PRINT"
13100 PRINT"
13110 PRINT"
13120 PRINT
13130 PRINT"
13140 PRINT"
13150 PRINT"
13160 PRINT"
13170 PRINT"
13180 PRINT"
13190 PRINT"
13200 PRINT
13210 PRINT
13220 PRINT
13230 PRINT
13240 INPUT"
13250 CLS
13260 PRINT
13270 PRINT
13280 PRINT
13290 PRINT
13300 PRINT
13310 PRINT
13320 PRINT
13330 PRINT
13340 PRINT"
13350 PRINT"
13360 PRINT"
13370 PRINT"
13380 PRINT"
13390 PRINT"
13400 PRINT
13410 PRINT
13420 PRINT
13430 PRINT
13440 PRINT
13450 PRINT
13460 PRINT
13470 PRINT
13480 INPUT"

To continue, press <ENTER>".P

Consider a situation where a contractor incorrectly" certified contract items as identical to ones previously" [government] approved. In a similar event another" contractor failed to tell the government about a change" in material for a previously approved component."

In both cases the contractor committed what looked" like fraud, but without an intent to deliberately mislead" the government. This type of error is called a" gross mistake by the contractor and, like fraud, overturns" the conclusiveness of government acceptance. However," the government's burden of proof for gross mistakes, as" well as for fraud and latent defects, is significant."

To continue, press <ENTER>".P

The final condition which can overturn government" acceptance is when warranties, (our discussion at the" beginning of this session), are explicitly provided for in" the contract. As we saw earlier, warranties assure the" government has an avenue for recourse with the contractor" after acceptance has occurred."

To continue, press <ENTER>".P

```

13490 COLOR 11,1
13500 CLS
13510 PRINT
13520 COLOR 14,1
13530 PRINT"                                SELF-TEST QUESTION"
13540 COLOR 11,1
13550 PRINT
13560 PRINT
13570 PRINT"        Complete the following statement."
13580 PRINT
13590 PRINT
13600 PRINT"        The burden of proof for latency, fraud, and gross mistakes"
13610 PRINT"        mistakes:"
13620 PRINT
13630 PRINT
13640 PRINT"                a. rests on the contractor."
13650 PRINT"                b. rests on the government."
13660 PRINT"                c. is the responsibility of a civil court of law."
13670 PRINT
13680 PRINT
13690 INPUT"        Select a, b, or c, and press <ENTER> ",A$
13700 IF A$="A" THEN 13830
13710 IF A$="a" THEN 13830
13720 IF A$="B" THEN 13800
13730 IF A$="b" THEN 13800
13740 IF A$="C" THEN 13830
13750 IF A$="c" THEN 13830
13760 PRINT
13770 PRINT
13780 PRINT"        ("A$") is not a choice. Try again."
13790 GOTO 13680
13800 PRINT
13810 PRINT"        Correct. Let's continue."
13820 GOTO 13870
13830 PRINT
13840 PRINT"        Incorrect. The correct answer is B. The burden of proof"
13850 PRINT"        in any of these three instances rests with"
13860 PRINT"        the government."
13870 PRINT
13880 INPUT"                                To continue, press <ENTER> ",P
13890 COLOR 14,1
13900 CLS
13910 PRINT
13920 PRINT
13930 PRINT
13940 PRINT"                                Concluding Remarks"
13950 PRINT
13960 PRINT
13970 COLOR 15,1
13980 PRINT"        Given the conclusiveness of acceptance and the"
13990 PRINT"        difficulties the government can have in proving claiēs"
14000 PRINT"        against a contractor, it is easy to see why the government"

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14010 PRINT" places such high priority on inspection programs. Further,"
14020 PRINT" the government's reliance on inspections as the primary"
14030 PRINT" means of ensuring product quality has minimized the role"
14040 PRINT" of warranties for many acquisitions. However, when system"
14050 PRINT" complexity or other factors suggest appreciable risk, the"
14060 PRINT" government turns to warranties for continued assurance of"
14070 PRINT" product quality after acceptance. These two critical"
14080 PRINT" mechanisms, inspection and warranty, are the government's"
14090 PRINT" tools for ensuring it receives what it bargains for when"
14100 PRINT" it makes purchases under contractual agreements."
14110 PRINT
14120 PRINT
14130 PRINT
14140 INPUT"                                     To continue, press <ENTER>";P
14150 COLOR 14,1
14160 CLS
14170 PRINT
14180 PRINT"                                     END OF LESSON"
14190 PRINT
14200 PRINT
14210 COLOR 15,1
14220 PRINT" You have completed the computerized text portion of"
14230 PRINT" this exercise. Before proceeding to the quiz, please do"
14240 PRINT" the following:"
14250 PRINT
14260 PRINT
14270 PRINT" 1. Open the quiz envelope and remove the quiz."
14280 PRINT
14290 PRINT" 2. Write the elapsed time shown on the blackboard on"
14300 PRINT" the cover of your quiz."
14310 PRINT
14320 PRINT" 3. On the computer keyboard, type the word SYSTEM and"
14330 PRINT" press the <ENTER> key."
14340 PRINT
14350 PRINT" 4. Turn off your monitor by depressing the ON/OFF"
14360 PRINT" button at the front of your color monitor."
14370 PRINT
14380 PRINT" 5. Open the quiz and answer the questions."
14390 PRINT
14400 END

```

Appendix C: End of Lesson Quiz

DIRECTIONS: Please circle the letter of the response which best answers or completes the following statements.

1. Though the terms in a contract can specify otherwise, government acceptance of a contractor's product can occur:
 - a. prior to delivery of the product.
 - b. at the time of delivery of the product.
 - c. after delivery of the product.
 - d. all of the above.
2. Government acceptance of contractor products:
 - a. is not conclusive since the government has the discretion to return items despite its earlier acceptance.
 - b. is conclusive, except for patent defects, fraud, gross mistakes, or warranties.
 - c. is conclusive, except for latent defects, fraud, gross mistakes, or warranties.
 - d. is not implied when government use or retention of the product interferes with the contractor's ownership.
3. Considering final inspection at a government facility, if a contractor's product is found defective and is not promptly removed, replaced, or corrected, the government:
 - a. may terminate the contract for default.
 - b. may remove or replace the defective product at the contractor's expense.
 - c. both a and b.
4. A defect existing at the time of the government's acceptance which could have been discovered is a latent defect.
 - a. True
 - b. False

5. If the government elects to reject a defective product:
 - a. it must allow the contractor to correct that defect if it can be repaired within the normal contract period.
 - b. it is under no obligation to give a contractor the opportunity to correct the defect.
 - c. it must notify the contractor no later than on the day of final product delivery.
6. In a contract dispute where the government submits that a defect is latent, the contractor might argue that the defect is, instead, patent.
 - a. True
 - b. False
7. The government's notice of rejection for nonconforming products does not have any specific format, but must always be in writing.
 - a. True
 - b. False
8. Express warranties:
 - a. must have their duration spelled out in the contract.
 - b. are required for contracts whose total costs exceed \$1 million.
 - c. need not physically appear in the contract when the contractor offers a Certificate of Conformance.
9. Implied acceptance by the government can result when timely notice of rejection is not given to the contractor.
 - a. True
 - b. False
10. The FAR indicates that resources for enforcing a warranty must be considered in the government's decision to include an express warranty in a contract.
 - a. True
 - b. False
11. The FAR specifies that a contractor must offer only those products which conform to contract requirements.
 - a. True
 - b. False

12. Since they are not specifically referenced in a contract, implied warranties are not binding on the contractor.
- a. True
 - b. False
13. Unless otherwise stated in the contract, when the government conducts an inspection on the premises of a contractor or its subcontractor, the costs of the inspection are borne by:
- a. both the government and contractor, shared equally.
 - b. the contractor only.
 - c. the government only.
14. The Uniform Commercial Code has been applied to government contracts:
- a. by Boards of Contract Appeals.
 - b. to substantiate implied warranties.
 - c. when the government seeks criminal charges against a contractor.
15. FAR recommendations for choosing the place of inspection include:
- a. the amount of inspection performed to date.
 - b. the requirements for special instruments available only at a specific location.
 - c. availability of government TDY funds.
 - d. supporting the best interests of the contractor.
16. An example of implied warranty of merchantability would be:
- a. the use of a microwave oven to warm food.
 - b. the use of a ticket to reserve a particular seat assignment at a Cincinnati Reds baseball game.
 - c. neither a or b.
 - d. both a and b.
17. A Certificate of Conformance is submitted by the contractor to the government:
- a. to document the government's acceptance at a final inspection.
 - b. when small losses would be incurred if the product should prove to be defective.
 - c. when costs are below a threshold established by the FAR.
 - d. none of the above.

18. The implied warranty of fitness for a particular purpose may be excluded from the contract either orally or in writing.
- a. True
 - b. False
19. Exceptions to the FAR requirement that the contractor perform all inspections and tests are approved by:
- a. the government project manager.
 - b. the contractor's program office.
 - c. the government contracting officer.
20. When a contractor defaults on a warranty, the decision to accept an equitable price reduction rests with:
- a. the government contracting officer.
 - b. the Boards of Contract Appeals.
 - c. the government project manager.

Appendix D: Attitude Survey

Part A. Please circle the appropriate response or fill in the blank as required.

AGE: 24 to 29
30 to 35
36 to 40
41 to 45
other: _____

SEX: Male or Female

EXPERIENCE: Please indicate your current AFSC: _____.

Part B. Please use the five point Likert scale provided below to evaluate the following statements.

5 Strongly Agree
4 Somewhat Agree
3 Neutral
2 Somewhat Disagree
1 Strongly Disagree

	(+)		(-)
a. The structure of the program would be improved if the concepts or topics were presented in reverse order.....	5	4	3 2 1
b. The program made it easy for me to distinguish main points from supporting details.....	5	4	3 2 1
c. The organization of the lesson prepared me to answer the quiz.....	5	4	3 2 1
d. I could anticipate topics or concepts as I progressed through the lesson.....	5	4	3 2 1
e. The structure and order of presentation made it easy to learn the text material.	5	4	3 2 1
f. The content of this course applies to my future career field.....	5	4	3 2 1
g. Concepts were appropriately defined when they were introduced in the lesson.....	5	4	3 2 1
h. Using questions in the text is an aid to learning.....	5	4	3 2 1

- | | (+) | | (-) |
|---|-----|---|-------|
| i. The lesson's instructions were easy to understand and execute..... | 5 | 4 | 3 2 1 |
| j. Concepts were covered with the appropriate level of detail..... | 5 | 4 | 3 2 1 |
| k. If you answered 1 or 2 to the previous item, please specify areas of inadequate detail in the space below. | | | |
| | | | |
| l. The end of lesson quiz was clear in both the questions asked and and responses provided..... | 5 | 4 | 3 2 1 |
| m. I would welcome taking another CBI lesson like this one..... | 5 | 4 | 3 2 1 |
| n. In general, CBI is a good method for presenting learning material..... | 5 | 4 | 3 2 1 |
| o. I would have learned the material in this lesson better from a paper copy..... | 5 | 4 | 3 2 1 |
| p. Visually, the screens were attractive and uncluttered..... | 5 | 4 | 3 2 1 |
| q. Visually, the screens were easy to read..... | 5 | 4 | 3 2 1 |
| r. If you answered 1 or 2 to the previous item, please indicate why in the space below. | | | |

Appendix E: Comments to the Attitude Survey

Participant comments to the attitude survey are provided below. The survey statements requesting these comments, as well as the scored statements preceding them, are provided to assist the reader in putting the responses in the appropriate context.

Response Area 1

Survey Item j: Concepts were covered with the appropriate level of detail.

Survey Item k: If you answered 1 or 2 to the previous item, please specify areas of inadequate detail in the space below.

Participant Responses to Item k:

1. Too much information in each paragraph. Long paragraphs made reading hard and retention difficult unless one reread the entire paragraph or portions of it.

2. I probably could not anticipate topics or concepts because the subject is not familiar to me.

Response Area 2

Survey Item q: Visually, screens were easy to read.

Survey Item r: If you answered 1 or 2 to the previous item, please indicate why in the space below.

Participant Responses to Item r:

1. Reading off a computer screen has no advantage over reading off a piece of paper. In fact, there was little or no ability to back-track if you didn't understand something. Taking advantage of a computer's ability to present graphics would have helped.

2. Paper copy allows for rereading if necessary. Use of only one paragraph or a list definitely made it easier and not intimidating (i.e., seeing a screenful).

3. Provide facility to back-up in lesson to review previous material (i.e., back-page). It would make the main points stand out more to put them in a different color.

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Vita

Captain James F. Altensee ~~born on 2 September 1955~~
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his commission on 30 October. His initial officer assignment
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Air Force Base in Colorado Springs, Colorado. As a Test
Engineer for the Site Activation Task Force, he managed the
DT&E (as well as IOT&E interfacing activities) of four major
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System, the Timing Subsystem, and the Weather Support Unit.
In addition, he worked in a matrixed capacity performing
sustaining engineering actions with regard to these
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~~[redacted]~~
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13. ABSTRACT (Maximum 200 words) Recent experiments emphasize the need for further research to determine how to design and use computer-based instruction (CBI) with maximum effectiveness. This research addresses that need by investigating the differences caused by top-down or deductive and bottom-up or inductive curriculum (lesson) structuring in self-paced CBI. Three research variables were measured to investigate these differences: student learning (measured by performance testing), CBI course completion time, and student attitude toward the learning experience. Computer programs, written for each curriculum structure using BASIC programming language, were administered to students at the Air Force Institute of Technology in post-test randomized design experiments. Descriptive statistics and nonparametric tests were used to analyze these results. The nonparametric tests showed that the data was not statistically significant (at 0.1) for any of the three variables. This key finding indicated that CBI educators can use either curriculum structure with almost equal effect. In addition, the differences which resulted were used to develop scenarios where one variable was seen as the primary objective with the other two of lesser (but still essential) importance. Such an analysis offers guidance to CBI educators seeking the structure which maximizes their particular learning objective.					
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